



Equity Research and Outreach

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Glossary

TERM	DEFINITION
ACS	American Community Survey
AGI	adjusted gross income
AIAN	American Indian and Alaska Native
ALICE	Asset Limited, Income Constrained, Employed
DOL	Department of Licensing
EV	electric vehicle
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FPL	federal poverty level
gas tax	Motor Vehicle Fuel Tax
HHS	Health and Human Services
HPMS	Highway Performance Monitoring System
HUD	Housing and Urban Development
MPG	miles per gallon
MSRP	manufacturer's suggested retail price
MVFT	Motor Vehicle Fuel Tax
NHTS	National Household Travel Survey
RUC	road usage charge
UGA	urban growth area
U.S.	United States
VIN	vehicle identification number
VMT	vehicle miles traveled
WFH	work from home
WSDOT	Washington State Department of Transportation
WSTC	Washington State Transportation Commission

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Executive Summary

In December 2019, the Washington State Transportation Commission (WSTC) adopted recommendations on how Washington can begin a gradual transition away from the state motor vehicle fuel tax (MVFT or gas tax) and toward a per-mile road usage charge (RUC) system. These recommendations followed extensive research, statewide public engagement, and detailed analysis of participant feedback from a year-long pilot project.

In 2020, the Legislature issued a proviso charging the WSTC to:

"Identify and measure potential disparate impacts of a road usage charge on designated populations, including communities of color, low-income households, vulnerable populations, and displaced communities."

This report summarizes the work conducted pursuant to the proviso, organized into the three workstreams as follows:

1. Quantitative analysis – financial impacts of RUC compared to the gas tax
2. Qualitative focus groups – perspectives on RUC and potential solutions from communities of color, low-income households, and vulnerable and displaced populations
3. Potential solutions – ideas to improve the way a RUC would impact communities of color, low-income households, and vulnerable and displaced populations.

Quantitative Analysis

This report explores the relative financial impacts by household income of Washington state transitioning from a gas tax to a RUC. It does not explore all dimensions of equity, but rather, focuses on income and specifically explores the following question: **Would households in various income brackets pay more or less under a potential RUC compared to the gas tax?**

This income-based equity analysis is only one piece of a larger discussion around transportation equity and funding. The broader discussion around transportation equity includes questions around who pays for transportation, where those revenues are invested, and how investments align with where and from whom revenues are collected. The scope of the quantitative analysis was to examine the costs paid under RUC compared with the gas tax across various income levels. The qualitative tasks explored other dimensions beyond cost.

Under RUC, the exclusive determinant of how much a household would pay is how many miles they drive. The available data show a clear correlation between income and miles driven: the more income a household makes, the more they drive, and therefore the more they would pay.

When comparing a household's annual costs under the current gas tax to a proposed RUC, the two factors to consider are the **vehicles miles traveled** (VMT) by that household and the **vehicle fuel economy** of that household's vehicles. VMT is the only factor that determines the total cost of RUC, while fuel efficiency is the only factor that determines the difference between the cost of RUC and the cost of gas taxes.

The proportion of household income that households spend on gas tax ranges from nearly zero to several percent. The lowest-income households devote, on average, 1.4 percent of their income to gas taxes, an amount that would be similar under a RUC. For most low-income households, the amount devoted to gas taxes is less than half the amount spent on state sales taxes and about one-fifth the amount spent on property taxes.

Based on examination of available data from the National Household Travel Survey (NHTS), there is no evidence that households within any individual income bracket in Washington would, on average, pay more or less under a RUC than under the current gas tax. Examination of Washington vehicle data from the Department of Licensing (DOL) revealed a statistically significant correlation between average fuel economy and average income among Washington Census tracts: the higher the income, the higher the fuel economy. This evidence supports the assertion that low-income households, on average, pay more in gas taxes per mile driven, while higher-income households pay less. However, the differences across income brackets are small. Areas with the lowest-income households would save less than \$10 per year under a RUC compared to the gas tax, while areas with the highest-income households would spend about \$20 more per year, on average.

Qualitative: Focus Groups

Yates Consulting conducted 17 focus groups with 129 participants over the course of eight months from June 2021 to January 2022. The focus groups were designed to gauge the sentiment of underrepresented and/or underserved communities. Each participant was asked 14 questions focused on knowledge of the RUC concept and their opinions of it. In addition, participants were asked what advantages they see in a RUC and to suggest any approaches the state could employ to mitigate any disadvantages. Lastly, our team used multiple choice questions to ask about preferences for reporting mileage and ways to pay for miles traveled.

Focus groups included people of color and of various income levels from all parts of the state. Participants came from different backgrounds, including some for whom English is a second language. Some participants did not drive due to physical disabilities.

Key findings included:

- Most participants knew nothing about the RUC concept and those who believed they did, thought it related to tolls.
- Most participants, regardless of age, income, ethnicity, gender, etc. immediately decided RUC would have a disproportionate impact on lower-income households. The participants did not know whether a RUC would be imposed in addition to or instead of the current gas tax.
- As participants gained more information on the need for a RUC, they became more supportive.
- The lack of a specific proposal caused participants to be hesitant to say anything positive about the RUC concept, and some refused to recognize any benefit for the state's residents.
- Most groups said more information would allow them to make better recommendations and except for one individual, everyone was willing to engage in future pilot programs.
- Some opposition to a RUC reflected opposition to taxes in general, transportation-related and otherwise.

Geography, occupation, and mobility were significant factors in the preferences and priorities of participants regarding a possible RUC.

- Focus group participants from Disability Rights Washington suggested that a portion of RUC funds be used for transit.
- Those in Central and Eastern Washington exchanged thoughts about the longer distances they drive for services.
- Professional drivers supported the “lump sum” RUC payment option (as opposed to a per mile charge) given the extensive amount of driving they do, as did some respondents in Central Washington.

Much of the time in the focus groups was spent identifying ways to provide lower-income individuals some relief and those suggestions are included in the report in the Potential Solutions section.

Potential Solutions

In conjunction with parallel research tasks, several potential solutions were identified to address both perceived and known challenges with RUC for low-income vehicle owners. Potential solutions include offering discounts for qualified low-income vehicle owners, creating a simple tab renewal-based method for reporting and paying RUC, and affording the option of making installment payments for RUC rather than annual lump sum payments. Each of these potential solutions addresses a challenge with RUC identified by participants in the focus groups.

As a next step, potential solutions will be further developed in the pilot stage of RUC research in 2022. Focus groups will be among those invited to test solution concepts through immersive simulations and prototypes.

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PART ONE: QUANTITATIVE ASSESSMENT: FINANCIAL IMPACTS OF A ROAD USAGE CHARGE COMPARED TO THE GAS TAX

1.0 INTRODUCTION

In December 2019, the Washington State Transportation Commission (WSTC) adopted recommendations on how Washington can begin a gradual transition away from the state motor vehicle fuel tax (MVFT or gas tax) and toward a per-mile road usage charge (RUC) system. These recommendations followed extensive research, statewide public engagement, and detailed analysis of participant feedback from a year-long pilot project.

In 2020, the State Legislature issued a proviso charging the WSTC to:

"Identify and measure potential disparate impacts of a road usage charge on designated populations, including communities of color, low-income households, vulnerable populations, and displaced communities."

This report provides information about the potential equity implications of Washington transitioning from a gas tax to a RUC. This memo does not explore all dimensions of equity, but rather, focuses on income and specifically explores the following question:

- Would households in various income brackets pay more or less under a potential RUC compared with the gas tax?

This section begins by defining equity for the purposes of this analysis, defining low-income, and outlining assumptions and data sources. Next, we summarize work to date on the impacts of a potential transition from the gas tax to a RUC. Finally, we present our findings related to the following questions, which support the broader research questions above:

- **Income distribution:** Who are low-income households in Washington?
- **Vehicle trends:** What is the relationship between fuel economy and vehicle type or age?
- **Household incomes and vehicles:** Are there trends between household incomes and vehicle types, age of vehicles, or vehicle fuel efficiency?

Finally, we present a comparison of estimated costs paid annually under the gas tax compared with a RUC. We present data for both Washington and the nation.

2.0 APPROACH

2.1 Defining Equity

We begin our equity analysis with the recognition that there are a variety of definitions of equity in relation to taxation. Some lenses of equity are defined below in relation to a potential RUC:

- **Horizontal equity:** This concept of equity is the notion that everybody in a group should be taxed the same amount for the same usage. A RUC is a per-mile charge drivers would pay based on how much they use the road system, which is similar to how people pay for their utilities, including electricity or water. It also reflects the original intent of the gas tax, implemented at a time when most vehicles consumed fuel at similar rates for similar amounts of travel. By its nature of being a flat per-mile fee, RUC would address this dimension of equity because everyone would pay the same amount for the same usage of the roads. Those who do not drive personal vehicles would not directly pay the tax, while those who choose alternatives to personal vehicle travel in order to drive less would pay less than those who use their personal vehicles for most transportation needs.
- **Vertical equity:** This concept of equity is about the ability to pay, and it considers the relative burden that a tax imposes upon households of varying income levels, often expressed as whether a tax is “regressive” or “progressive.” A regressive tax results in lower-income households paying a greater share of their income than do higher-income households in return for the same benefit. A progressive tax is differentiated based on income, so that higher income households pay proportionally at least as much as lower-income households to receive the same benefit. As a consequence, progressive taxes reduce or eliminate disparities in tax burden experienced by households of different income levels.
- **Vehicle weight equity:** This concept is about the question of whether light-duty vehicles or heavy-duty vehicles have different impacts on the road and whether that should impact how much users pay. Research shows that vehicles under about 10,000 pounds have equivalent pavement impacts regardless of weight.¹ While vehicles above that weight tend to impact pavements exponentially more as their weight increases, suggesting that heavier vehicles ought to pay progressively more for road usage than light-duty vehicles as their weight increases. Washington’s exploration of RUC has focused on light-duty vehicles under 10,000 pounds. A weight-based RUC rate has not been explored for vehicles over 10,000 pounds, and there is no engineering or economic rationale for varying rates by weight for vehicles that weigh less than 10,000 pounds.
- **Geographic equity:** This concept is about whether urban and rural areas would be impacted differently by a potential transition to a RUC. This analysis has been addressed in prior studies such as the 2015 WSTC study (Road Usage Charge Assessment: Financial and Equity Implications for Urban and Rural Drivers) and 2017 RUC West study (Financial Impacts of Road User Charges on Urban and Rural Households), which are detailed in **Appendix A: Impacts of a RUC on Urban and Rural Households**. In general, these studies found that RUC improves

¹ See, e.g., National Cooperative Highway Research Program Report 353, “Effects of Heavy Vehicle Characteristics on Pavement Response and Performance,” 1993.

geographic equity by bringing average payments per-mile closer together. Rural residents tend to drive less fuel-efficient vehicles than residents living in urban areas, equating to them paying slightly more under the gas tax on average. Under a RUC, rural residents driving less fuel-efficient vehicles would pay less than they pay under the gas tax, and urban residents driving more fuel-efficient vehicles would pay more than they pay under the gas tax. This outcome brings the average per-mile taxes paid closer together regardless of where one resides.

- **Cross-generational equity:** This concept considers the effects of current actions on the fair and just distribution of benefits and burdens to future generations. Examples relevant to a RUC could include health outcomes, climate change impacts, and debt. For example, because RUC is more salient (visible) than the gas tax, it could influence travel behavior and reduce or induce demand for transit, walking, and biking, even if the individual financial impact is, on average, the same as the gas tax. In turn, this could impact health, reduce pollution, and mitigate carbon emissions over the long run.
- **Systems equity / Operational equity:** This concept of equity is about the ability to interact with and comply with a potential RUC system in terms of user interface, technology, language, and trust.
- **Process equity:** This concept is about the ability of all affected parties to participate in and shape policy and implementation by providing input.

The latter two types of equity are being addressed through outreach efforts in the Forward Drive RUC research project, which aim to engage a broad cross-section of affected drivers to understand system impacts.

2.2 Assessing Equity

In the financial analysis reflected in this report, we focus on the financial equity implications of transitioning from the current road funding mechanism (gas tax and flat electric vehicle [EV] fees) to a RUC. Specifically, we focus on vertical equity (ability to pay).

2.2.1 Assumptions

This analysis is based on the following assumptions:

- The RUC rate would be “revenue-neutral” and therefore equivalent to what a driver of an average fuel efficiency light duty vehicle in Washington currently pays under the 49.4 cents per gallon gas tax. The average fuel efficiency is assumed to be 20 miles per gallon (MPG). This rate is 2.4 cents per mile.

$$\frac{49.4 \text{ cents per gallon}}{20 \text{ miles per gallons}} = 2.4 \text{ cents per mile}$$

Equity in Transportation Funding

This income-based equity analysis is only one piece of a larger discussion around transportation equity and funding. The broader discussion around transportation equity includes questions such as:

- How much of transportation funding is paid by whom?
- Where and on what are transportation revenues invested?
- How do the locations, modes, and types of transportation investments correspond to who and where revenues are collected from?

RUC is not an allocation mechanism, nor is it an expression of preferences or decisions about how much to spend or on what. RUC is a revenue collection mechanism proposed as a replacement for the existing mechanism of gas taxes and flat EV fees. Therefore, these broader questions about transportation equity are subject to separate analysis beyond the scope of the WSTC’s research.

- We assume that vehicle owners paying a RUC would no longer pay the flat EV fee of \$225 or pay the gas tax.
- We assume, consistent with literature on the subject, that consumers are currently bearing the full cost of the 49.4 cents per gallon gas tax (meaning that gas sellers do not absorb the cost of the tax). If Washington transitioned from a gas tax to a RUC, consumers would continue to bear the full cost of RUC, while no longer paying the 49.4 cents per gallon of gas tax. This means motorists would continue to pay for roads and bridges, so we can compare the impacts of the two revenue mechanisms among motorists by household income. (See **Appendix C** for more detail.)

2.2.2 Data

The primary data sources used in this analysis are:

- **United States (U.S.) Federal Highway Administration’s (FHWA) National Household Travel Survey (NHTS)**, which includes daily non-commercial travel by all modes, including characteristics of the people traveling, their household income, and their vehicles. The most recent year of data available is 2017, with the next survey publication anticipated before 2025. The 2017 NHTS collected responses from 129,696 U.S. households with 650 of those households identifying as Washington drivers.
- **The American Community Survey (ACS)** is a nationwide survey conducted by the U.S. Census Bureau, updated annually. The ACS collects information such as age, race, income, and other important data points from U.S. individuals and households.
- **FHWA Highway Performance Monitoring System (HPMS)** is a national information system that contains data on public roadways, including road miles, road characteristics, and miles traveled on roadways by vehicles. The Washington State Department of Transportation (WSDOT) makes HPMS data available for Washington roadways.
- **FHWA Highway Statistics Series** is a comprehensive set of annual reports on motor vehicle data, including vehicle miles traveled (VMT), vehicle registrations, and driver licenses. Data are available at both the national and state level.
- **Department of Licensing (DOL)** vehicle registry data supplied for this study included a snapshot of every registered light-duty vehicle in the state as of July 2021, including Vehicle Identification Number (VIN) and the Census tract where the vehicle is registered.

No personally-identifying information was accessed or used for purposes of this analysis.

2.2.3 Methodology

NHTS data was used to estimate annual costs to Washington households under the state’s current gas tax as well as under the proposed RUC rate described in Section 1.2.2.1 above. For each household in the NHTS, annual costs from the gas tax and proposed RUC were estimated based on estimated VMT, estimated fuel economy, and estimated gas consumption. The following is a description of how each of those three respective variables were derived for the NHTS:

- VMT were derived for each vehicle by the U.S. Department of Energy’s Oak Ridge National Laboratory based on either odometer readings, self-reported estimates of annual mileage, or extrapolation based on mileage a vehicle is driven during a designated sample day.

- Each vehicle’s fuel economy was estimated based on Environmental Protection Agency (EPA) fuel economy test results and adjusted based on actual on-road, in-use differences observed during the NHTS data collection period.
- Fuel consumption (gallons) for each vehicle was derived by dividing each vehicle’s estimated VMT by its estimated fuel economy.

2.2.4 Estimating Gas Tax Costs

- To estimate household gas tax costs, we summed the estimated annual fuel consumption for each household vehicle based on NHTS data.
- The current tax rate of \$0.494 per gallon was applied to each household’s estimated annual fuel consumption to derive each household’s annual gas tax cost. Note this represents only the state gas tax and does not include federal gas taxes (an additional \$0.184 per gallon).

2.2.5 Estimating RUC Costs

- To estimate potential household RUC costs, we first calculated annual VMT for each household by adding together estimated VMT for each vehicle in each household, based on NHTS data.
- The assumed RUC rate of \$0.024 per mile was applied to each household’s estimated annual VMT to derive each household’s annual RUC cost.

Given our analysis focused on differences in cost impacts by income, estimated household gas tax costs and RUC costs were totaled and averaged within each of the following income bands:

- Less than \$25,000
- \$25,000 to \$49,999
- \$50,000 to \$74,999
- \$75,000 to \$99,999
- \$100,000 to \$149,999
- \$150,000 or more

2.3 Defining Low-income in Washington

In Washington, there are several measures used by various agencies to define whether an individual or household is “low-income.” There is no one definition for a “low-income” household. Below, we outline several commonly used measures.

2.3.1 Federal Poverty Guidelines

The federal poverty guidelines, also known as the federal poverty level (FPL), are measures of income issued annually by the U.S. Department of Health and Human Services (HHS). The official poverty thresholds for the U.S. that form the basis of the federal poverty guidelines were developed in the mid-1960s and have remained unchanged since, save for annual inflation adjustments. These thresholds were derived by determining the cost of a minimum food diet (the cost of providing basic nutrition for members of a household) multiplied by three, as the cost of food was estimated to be one-third of an average household’s expenses.

- The guidelines vary based on family size and are issued in three sets: one for the contiguous 48 states, one for Hawaii, and one for Alaska.

There has been considerable discussion among researchers and advocates about the federal poverty guidelines, including that the guidelines are based on outdated measures, that the thresholds are set too low and are not capturing additional households that struggle to pay for basic necessities (see discussion on the United Way’s ALICE measure on page 7), and that the measures don’t account for cost-of-living differences among various states, metropolitan areas, rural areas, or other geographies.

The purpose of the federal poverty guidelines is administrative as they are used to determine financial eligibility for a wide variety of federal programs. Some state and local programs also use federal poverty guidelines to determine eligibility.

- Financial eligibility criteria are often expressed as percentage multiples of the federal poverty guidelines in order to extend eligibility to additional households above the poverty line who struggle with meeting basic needs.

For example, eligibility for the U.S. Department of Agriculture’s National School Lunch Program is either 130 percent of FPL (for free lunch) or 185 percent of FPL (for reduced lunch). For context, in 2021, 130% of FPL for a family of four would be \$34,450, less than half of the state’s median household income of \$73,775.

Table 2-1 details some examples of financial eligibility thresholds for programs that utilize federal poverty guidelines.

Table 2-1 Financial Eligibility Thresholds Based on Federal Poverty Guidelines

PROGRAM	ELIGIBILITY THRESHOLD
Supplemental Nutrition Assistance Program (SNAP)	200% of FPL
Washington Apple Health (Medicaid) coverage	133% of FPL
National School Lunch Program	130% of FPL (Free) 185% of FPL (Reduced)
Low-income Home Energy Assistance Program (LIHEAP)	150% of FPL
King County Metro – ORCA LIFT	200% of FPL

Sources: King County Metro, 2021; HHS, 2021; Department of Agriculture, 2021; BERK, 2021.

Notes: SNAP is known as the Washington Basic Food Program in Washington State. Washington Apple Health provides a variety of programs – the eligibility threshold shown above is for adults between 19 and 65 years of age and who are not entitled to Medicare, among other requirements. Washington Apple Health also provides different programs targeted towards specific populations, such as pregnant women and children, which have different eligibility thresholds. For example, under Washington Apple Health coverage is provided to pregnant individuals with income at or below 193 percent FPL while coverage is provided to children in households with incomes at or below 210 percent FPL.

2.3.2 Department of Housing and Urban Development Income Limits

The U.S. Department of Housing and Urban Development (HUD) sets annual income limits that determine eligibility for several housing programs. HUD income limits are based on Median Family Income estimates for each metropolitan area, parts of some metropolitan areas, and each non-metropolitan county.

HUD defines low-income families and individuals as earning at or below 80 percent MFI, very low-income families and individuals as earning at or below 50 percent of MFI, and extremely low-income families and individuals as earning at or below 30 percent of MFI.

2.3.3 Minimum Wage

Another way to define “low-income” individuals may be to base the definition on the state’s minimum wage. Currently, the minimum wage in Washington is set at \$13.69 per hour. Assuming full time employment (i.e., working 40 hours a week), an individual earning the minimum wage would accrue a little over \$28,000 in annual wages.

Some local jurisdictions within Washington have set higher minimum wage standards than the state, such as Seattle and SeaTac, which are set at \$16.69 and \$16.57 per hour, respectively. As this study is taking a statewide look at which households or individuals are “low-income,” we will focus on the state minimum wage when comparing low-income thresholds in **Table 2-2** below.

2.3.4 Asset Limited, Income Constrained, Employed

Another measure for defining individuals or families facing financial hardship is the Asset Limited, Income Constrained, Employed (ALICE) framework. Compiled by United Way of the Pacific Northwest, ALICE measures are based on the bare minimum cost of household basics necessary to live and work and are calculated separately by county and for different household types, capturing differences in costs of living across the state. Basic budget items include housing, childcare, food, transportation, technology, health care, as well as taxes and a contingency fund equal to 10 percent of the household budget.

As of 2018, 33 percent of Washington’s households were classified as ALICE households compared with just 10 percent of Washington households that were classified living below the FPL (i.e., 100 percent FPL). As discussed earlier, FPL thresholds were developed in the mid-1960s and have remained unchanged since, save for annual inflation adjustments. They may not capture all the costs of living and differences by geography that are captured in the ALICE framework. Since ALICE thresholds are calculated by county and for different household types, it may be a more comprehensive view of household abilities to meet basic needs across the state. **Figure 2-1** shows the share (percent) and number of households below the ALICE threshold in each county.

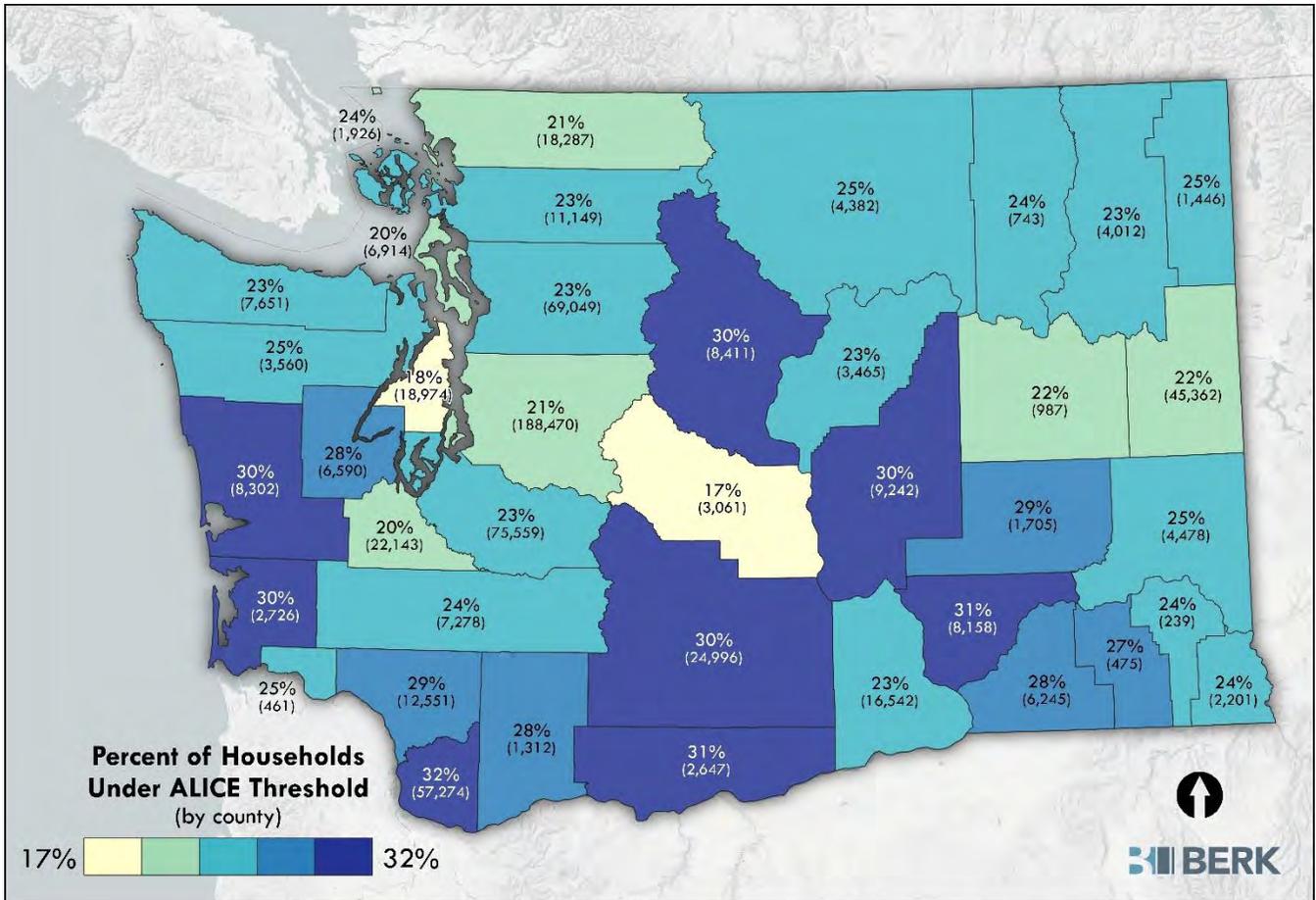
2.3.5 Comparison of Low-income Thresholds

Table 2-2 shows annual incomes for different household sizes based on various low-income thresholds. Understanding the annual wages in dollar amounts rather than percentages for various household sizes can be helpful when discussing these low-income thresholds.

Table 2-2 Comparison of Low-income Thresholds

HOUSEHOLD SIZE	135% OF FEDERAL POVERTY LEVEL (FPL)	200% FPL	HUD LOW-INCOME LIMIT (80% OF MEDIAN FAMILY INCOME)	WA STATE MINIMUM WAGE EQUIVALENT (225% FPL)	ASSET LIMITED, INCOME CONSTRAINED, EMPLOYED (ALICE)
1 Person	\$17,388	\$25,760	\$51,300	\$28,980	\$22,524
2 Person	\$23,517	\$34,840	\$58,600	\$39,195	\$33,828 - \$42,254
3 Person	\$29,646	\$43,920	\$65,950	\$49,410	\$45,132 - \$61,984
4 Person	\$35,775	\$53,000	\$73,300	\$59,625	\$56,436 - \$81,714
5 Person	\$41,904	\$62,080	\$79,150	\$69,840	\$67,740 - \$101,444
6 Person	\$48,033	\$71,160	\$85,000	\$80,055	\$79,044 - \$121,174
7 Person	\$54,162	\$80,240	\$90,850	\$90,270	\$90,348 - \$140,904
8 Person	\$60,291	\$89,320	\$96,750	\$100,485	\$101,652 - \$160,634

Sources: HHS; 2021; HUD, 2021; United Way of the Pacific Northwest, 2020; BERK, 2021.

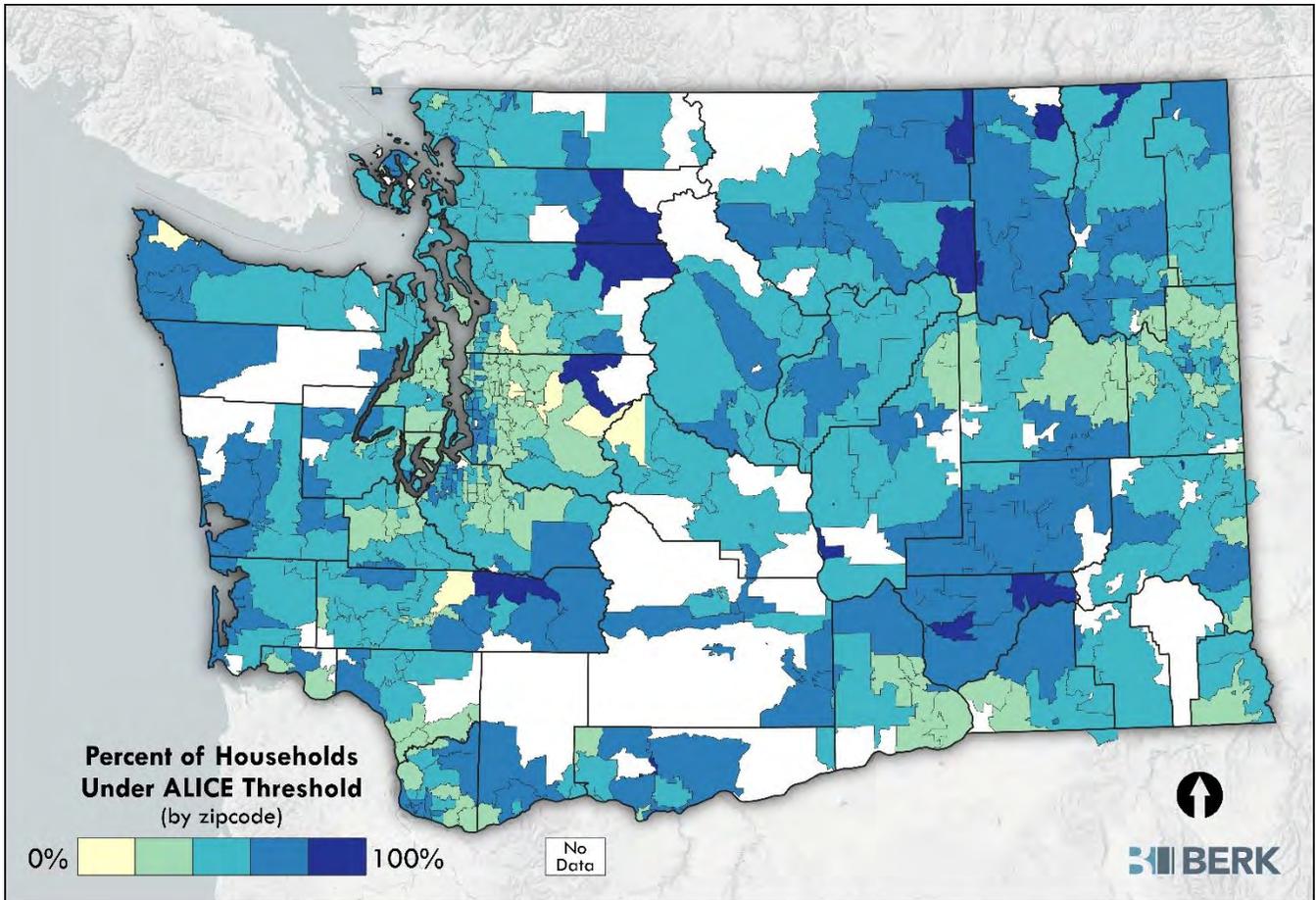


Sources: United Way ALICE Threshold, 2021; American Community Survey, 2018; BERK, 2021.

Note: The ALICE framework for defining individuals or families dealing with financial hardship is compiled by United Way and is based on the bare minimum cost of household basics necessary to live and work. It is calculated separately by county and for different household types. Basic budget items include housing, childcare, food, transportation, technology, health care, as well as taxes and a contingency fund equal to 10 percent of the household budget.

Figure 2-1 Percentage and Number of Households below ALICE Threshold by County

Figure 2-2 shows the share of households below the ALICE threshold in each zip code.



Sources: United Way ALICE Threshold, 2021; American Community Survey, 2018; BERK, 2021.

Note: The ALICE framework for defining individuals or families dealing with financial hardship is compiled by United Way and is based on the bare minimum cost of household basics necessary to live and work. It is calculated separately by county and for different household types. Basic budget items include housing, childcare, food, transportation, technology, health care, as well as taxes and a contingency fund equal to 10 percent of the household budget.

Figure 2-2 Percent of Households below ALICE Threshold by Zip Code

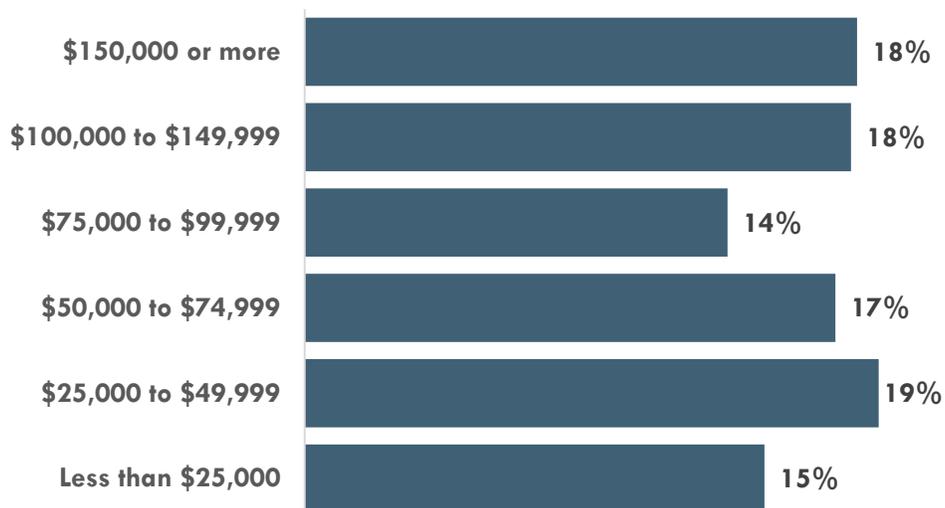
3.0 FINDINGS

3.1 Income Distribution in Washington

Recognizing different definitions of low-income in Washington and how annual incomes correspond to these different threshold definitions, it is important to understand who low-income households are in the state. We begin with some baseline statistics showing how many people fall into each income bracket, trends between income levels and where households live, and the correlations between household income and race and ethnicity.

3.1.1 How Many People Fall Into Each Income Bracket?

We begin our income-based equity analysis with a summary of how Washington households are distributed across income brackets. **Figure 3-1** shows the distribution of Washington households across income brackets. As a note, households of various sizes are contained within each income bracket. Around 15 percent of Washington households have an income of less than \$25,000, and around 34 percent of Washington households have an income of less than \$50,000.



Sources: American Community Survey 5-Year Estimates, 2019; BERK, 2021.

Figure 3-1 Households by Income Bracket, Washington State Households

3.1.2 Where Do Lower Income Households Live?

Next, we analyzed the question of how households across different geographic areas fall within income brackets to understand whether urban or rural households are disproportionately represented in any income brackets. The analysis showed that household location and geography is not a factor in determining whether a low-income household will pay more or less under RUC compared to the gas tax.

There is no universally agreed definition of urban versus suburban versus rural areas. For purposes of this analysis, we sorted each U.S. Census block group in Washington into one of three categories based on whether it was inside a city or town (urban), inside an urban growth area (UGA) (suburban), or outside an UGA (rural). For example, Census blocks inside cities like Seattle, Vancouver or even

smaller incorporated cities and towns like Centralia, Yakima, or Davenport, qualify as urban. Areas outside cities but inside UGAs such as the developed areas north of Vancouver, the developed areas between Bothell and Mill Creek, or the residential development north of Spokane city limits all qualify as suburban. Rural areas are typically very low density residential with small pockets of commercial development, open space, agriculture, and other resource-related land uses. Communities surrounding Hood Canal, much of the San Juan Islands, and most Eastern Washington farmlands all qualify as rural.²

From WSTC’s prior research, we know that perceptions and concerns about RUC vary by geography. Support in rural areas is lower than in urban areas, driven by a perception among rural households that RUC is punitive given the longer distances they must drive for non-discretionary trips such as groceries. Given these differences by geography, understanding where households live by income group is important as we consider the impact of implementing a RUC on households of different income levels.

The costs of living in urban areas, UGAs, and rural areas may be different. While a similar percentage of households in each income bracket may be urban or rural households, it is possible that urban households with incomes of less than \$50,000 are more likely to be low-income than rural households with less than \$50,000.

This analysis displays the percentage of each income bracket from urban or rural households, but does not define different low-income thresholds based on geography.

Below are several figures that summarize the distribution of households in Washington by location (east vs. west), geography (urban, UGA, and rural), and income. This information shows us the following:

- **Figure 3-2** shows the proportional distribution of households by geography and income for the west side of the state. **Figure 3-3** shows this information along with the total number of households in each income bracket. For Western Washington households, the likelihood of living in an urban, suburban, or rural area does not vary by household income.
- **Figure 3-4** shows the proportional distribution of households by geography and income for the east side of the state. **Figure 3-5** shows this information along with the total number of households in each income bracket. For Eastern Washington households, the likelihood of living in an urban, suburban, or rural area does vary by income – higher-income Eastern Washington households are more likely to live in rural areas than lower-income Eastern Washington households.

² More specifically, we categorized Census block groups as urban incorporated ("urban") if the center of the block group was inside a city or town. We categorized a Census block group as urban growth area (UGA) ("suburban") if the center of the block group was inside an UGA. Under Washington State’s Growth Management Act (GMA), counties that are fully planning under the GMA must designate UGAs, which are areas where “urban growth shall be encouraged and outside of which growth can occur only if it is not urban in nature” ([RCW 36.70A.110](#)). We categorized all other Census block groups as rural.



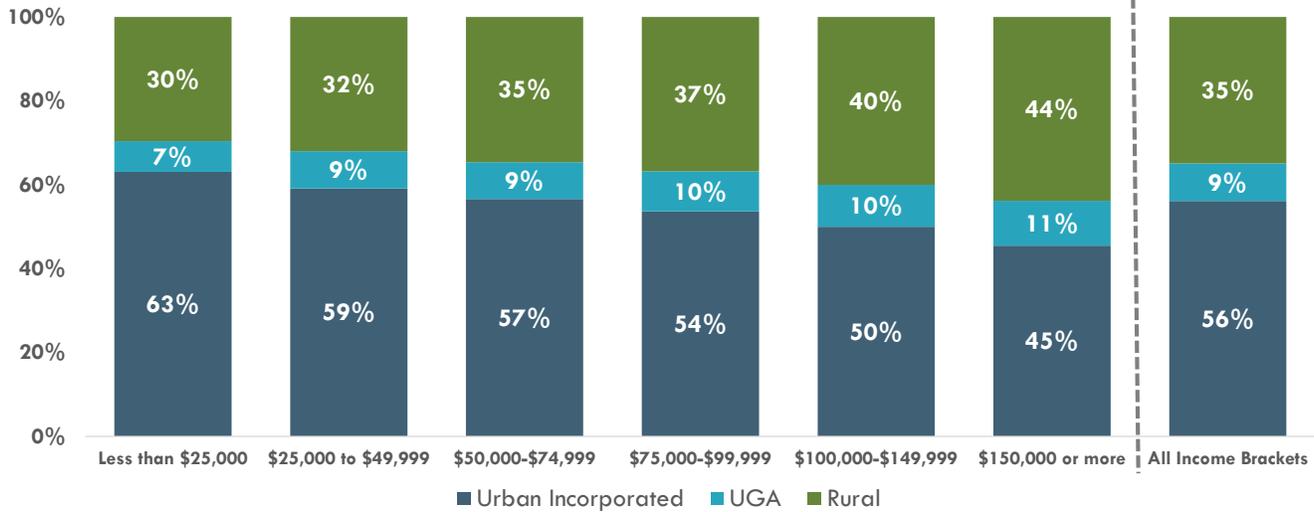
Sources: American Community Survey 5-Year Estimates, 2019; Washington State Department of Ecology, 2021; BERK, 2021.
 Note: West includes the following counties: Clallam, Clark, Cowlitz, Grays Harbor, Island, Jefferson, King, Kitsap, Lewis, Mason, Pacific, Pierce, San Juan, Skagit, Skamania, Snohomish, Thurston, Wahkiakum, and Whatcom.

Figure 3-2 Households by Income Bracket and Geographic Category: West (Proportional)



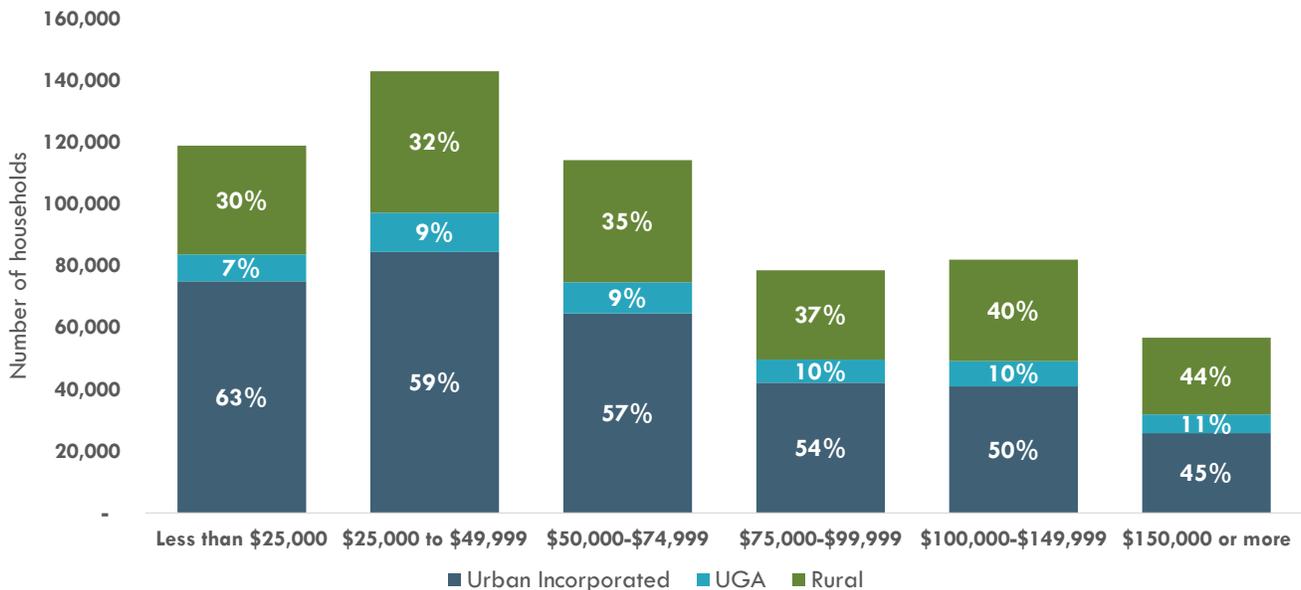
Sources: American Community Survey 5-Year Estimates, 2019; Washington State Department of Ecology, 2021; BERK, 2021.
 Note: West includes the following counties: Clallam, Clark, Cowlitz, Grays Harbor, Island, Jefferson, King, Kitsap, Lewis, Mason, Pacific, Pierce, San Juan, Skagit, Skamania, Snohomish, Thurston, Wahkiakum, and Whatcom.

Figure 3-3 Households by Income Bracket and Geographic Category: West (Total)



Sources: American Community Survey 5-Year Estimates, 2019; Washington State Department of Ecology, 2021; BERK, 2021.
 Note: East includes the following counties: Adams, Asotin, Benton, Chelan, Columbia, Douglas, Ferry, Franklin, Garfield, Grant, Kittitas, Klickitat, Lincoln, Okanogan, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman, and Yakima.

Figure 3-4 Households by Income Bracket and Geographic Category: East (Proportional)



Sources: American Community Survey 5-Year Estimates, 2019; Washington State Department of Ecology, 2021; BERK, 2021.
 Note: East includes the following counties: Adams, Asotin, Benton, Chelan, Columbia, Douglas, Ferry, Franklin, Garfield, Grant, Kittitas, Klickitat, Lincoln, Okanogan, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman, and Yakima.

Figure 3-5 Households by Income Bracket and Geographic Category: East (Total)

The geographic distribution of the low-income population in Washington means that, on the whole, lower-income households in Washington are unlikely to be disproportionately burdened by RUC based solely on *where* they live (in a rural or urban area). See **Appendix A** for a summary of prior research on the impact of a transition from the gas tax to a RUC on urban and rural households. Again, what type of vehicle they drive is the sole determinant of how low-income households are affected by RUC relative to the gas tax. See **Appendix B** for a detailed statistical analysis of the relationship between driving, fuel consumption, and income among NHTS survey respondents.

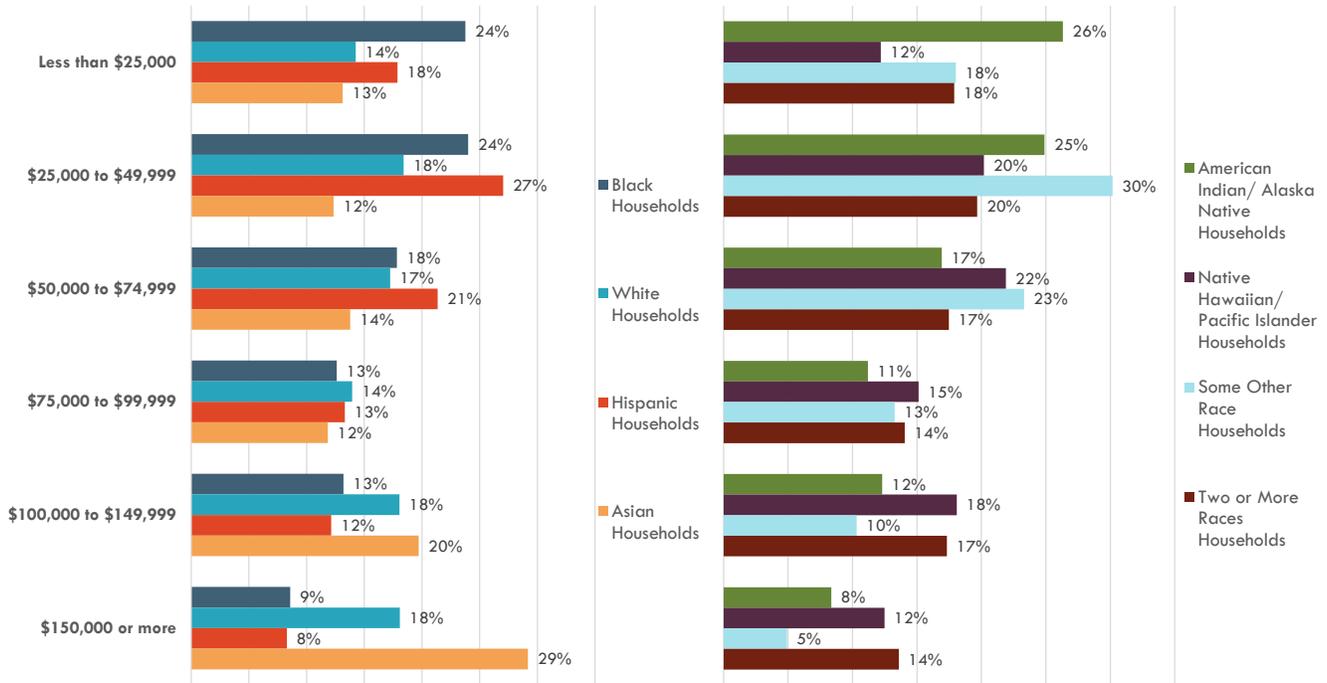
3.1.3 How Do Incomes Correspond with Race and Ethnicity?

In this section, we analyze Washington household income by race and ethnicity. We are interested in understanding whether any households are disproportionately represented in any income brackets. **Figure 3-6** shows the distribution of households within each racial group across six income categories. Key takeaways are:

- White households and multiracial households are relatively evenly distributed across the income spectrum.
- Black households and American Indian and Alaska Native (AIAN) households are overrepresented among lower income groups and underrepresented among higher income groups.
- Asian American households are underrepresented among lower income groups and overrepresented among higher income groups.
- The distribution of Hispanic households, Native Hawaiian and Pacific Islander households, and households identifying as another race across income groups follows a version of a bell curve, with these households more concentrated among the middle-income groups of \$25,000 to \$74,999 and less concentrated in the lowest income and highest income groups.

It is important to recognize that there is variation within each of these race and ethnicity groups that is not captured by the Census data.

Understanding how household incomes differ by race and ethnicity is important as we consider the impact of implementing a RUC. If a RUC were to burden lower-income households more than higher-income households, Black and AIAN households would be disproportionately affected.



Sources: American Community Survey 5-Year Estimates, 2019; BERK, 2021.

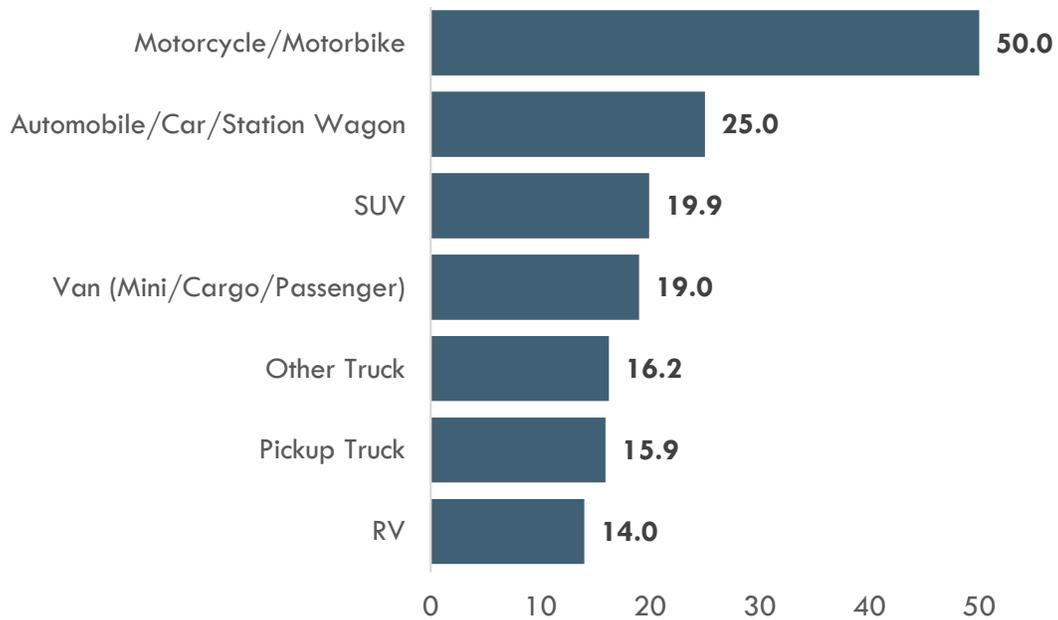
Figure 3-6 Distribution of Income by Race, Washington State Households

3.2 Vehicle Fuel Economy

When comparing costs to a household under the current gas tax compared with a proposed RUC, the two factors to consider are the vehicles miles traveled by that household and the vehicle fuel economy of that household’s vehicles. The next set of research questions focus specifically on vehicle fuel economy and how that relates to vehicle type, age, and income.

3.2.1 What Types of Vehicles have Lower Fuel Economy?

Figure 3-7 compares average fuel economy across vehicle categories in the U.S. as of 2017. Fuel economy varies across vehicle types. Among the most common vehicle types in the U.S. fleet, automobiles, cars, and station wagons have an average fuel economy of 25.0 MPG while SUVs have an average fuel economy of 19.9 MPG.

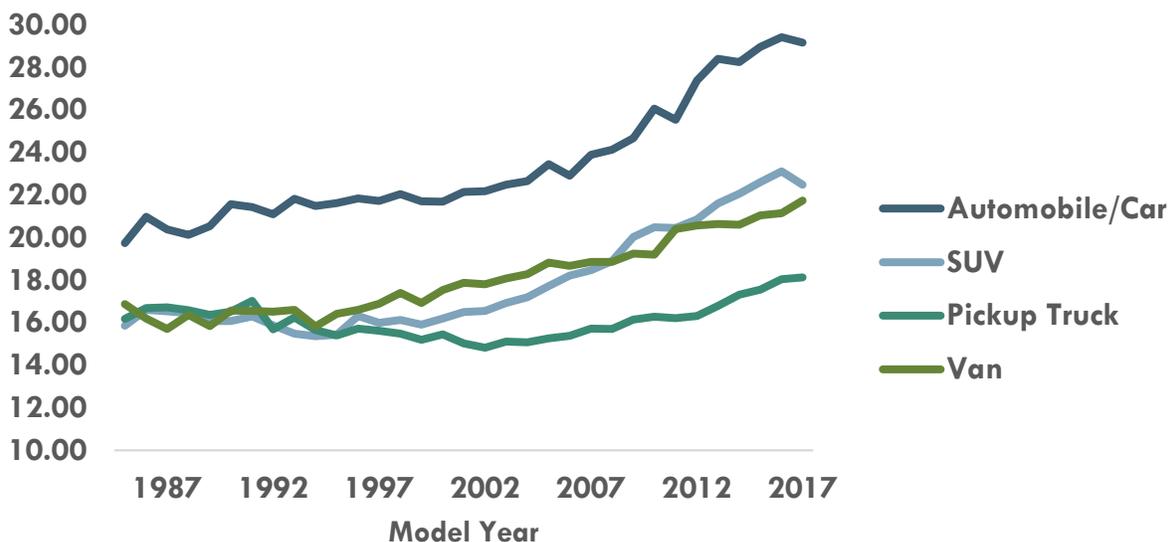


Sources: Federal Highway Administration National Household Travel Survey, 2017; BERK, 2021.

Figure 3-7 Average Fuel Economy by Vehicle Category, 2017, U.S.

3.2.1.1 How Does Fuel Economy Vary by Vehicle Age?

Figure 3-8 compares average vehicle fuel economy with vehicle model year. The data shows that older automobiles/cars, SUVs, pickup trucks, and vans tend to be less fuel efficient than newer vehicles.



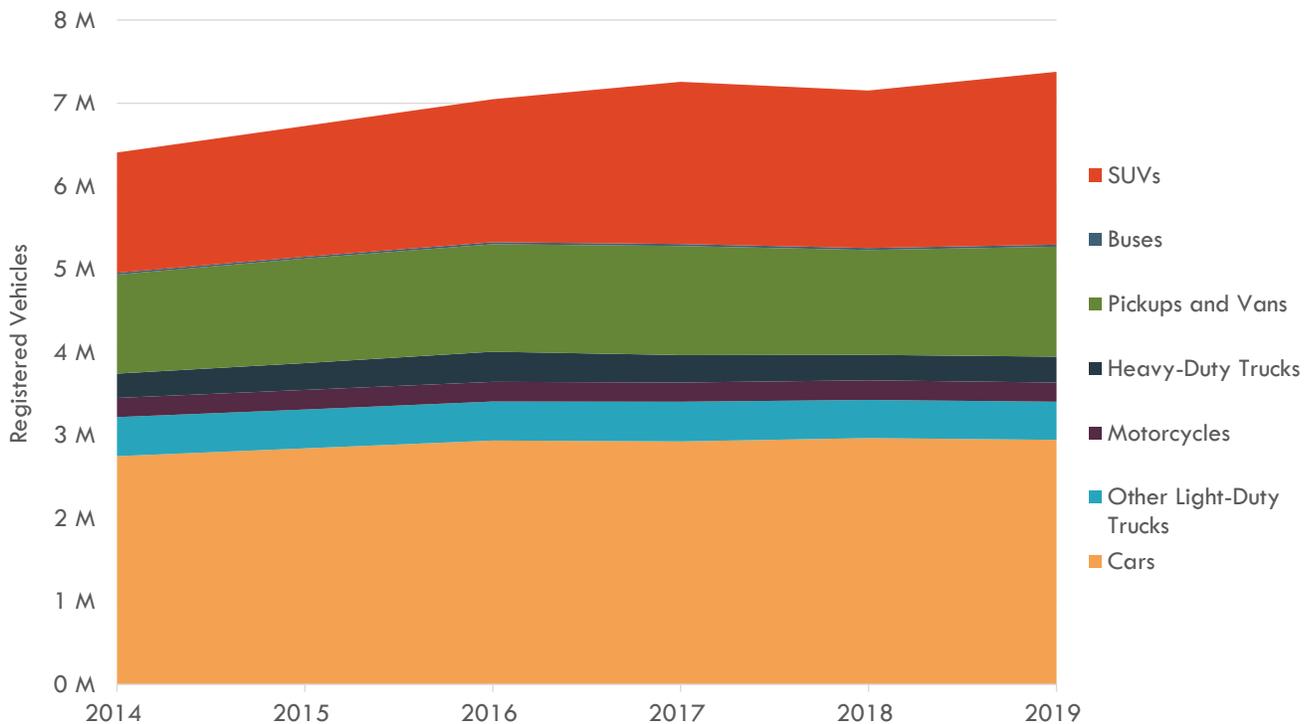
Sources: Federal Highway Administration National Household Travel Survey, 2017; BERK, 2021.

Note: NHTS results may not be representative of Washington state households as a whole as the survey was not designed to be representative at the state level.

Figure 3-8 Average Vehicle Fuel Economy by Vehicle Model Year, Washington Households

3.2.2 What Are the Vehicle Trends in Washington?

Washington residents have been purchasing more SUVs in recent years, which tend to be less fuel efficient than smaller vehicles. **Figure 3-9** shows total vehicle registrations in Washington state by vehicle type between 2014 and 2019. **Most of the increase in the number of registered vehicles is driven by an increase in the number of registered SUVs** (including crossover utility vehicles, or CUVs, which are smaller than traditional SUVs). From 2014 to 2019, the number of registered SUVs increased by 44 percent, compared to 11 percent for pickups and vans and just 7 percent for cars.

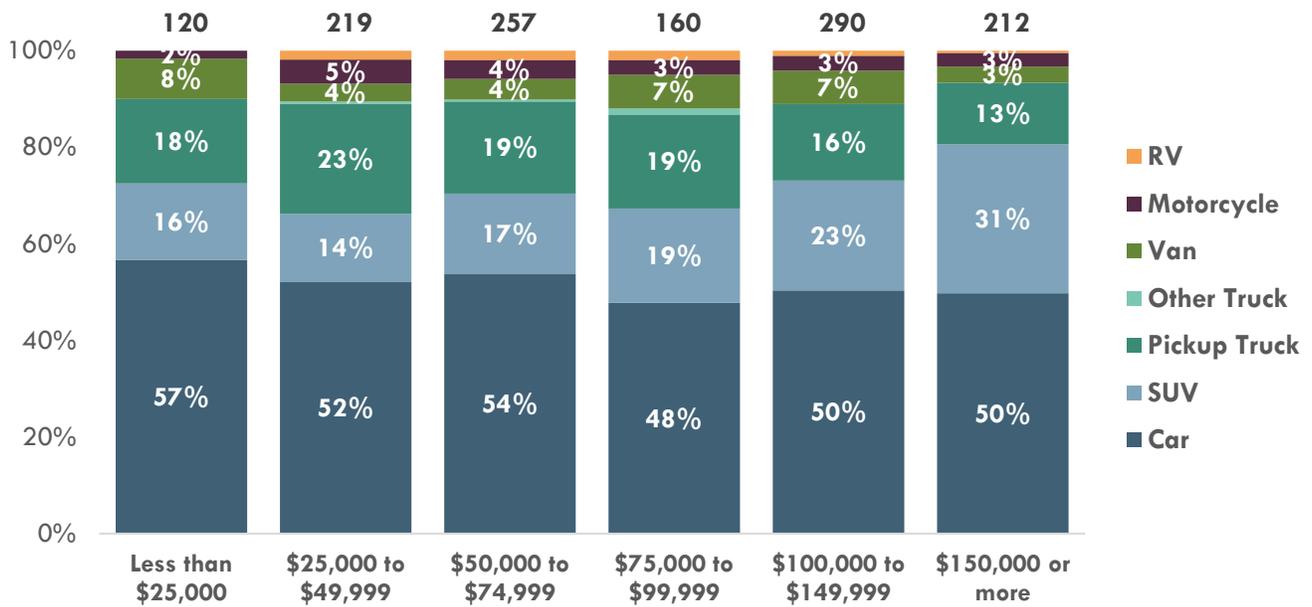


Sources: FHWA Highway Statistics, 2019; BERK, 2021.

Figure 3-9 Registered Vehicles by Vehicle Type, Washington State

3.2.3 How Do Household Vehicle Types Vary Based on Income?

Figure 3-10 outlines the distribution of vehicle types by household income bracket for Washington households. The data suggests that the vehicle fleet for lower income respondent households consists of a **higher proportion of cars, a lower proportion of SUVs, and higher proportion of pickup trucks** relative to the vehicle fleet of higher-income respondent households.



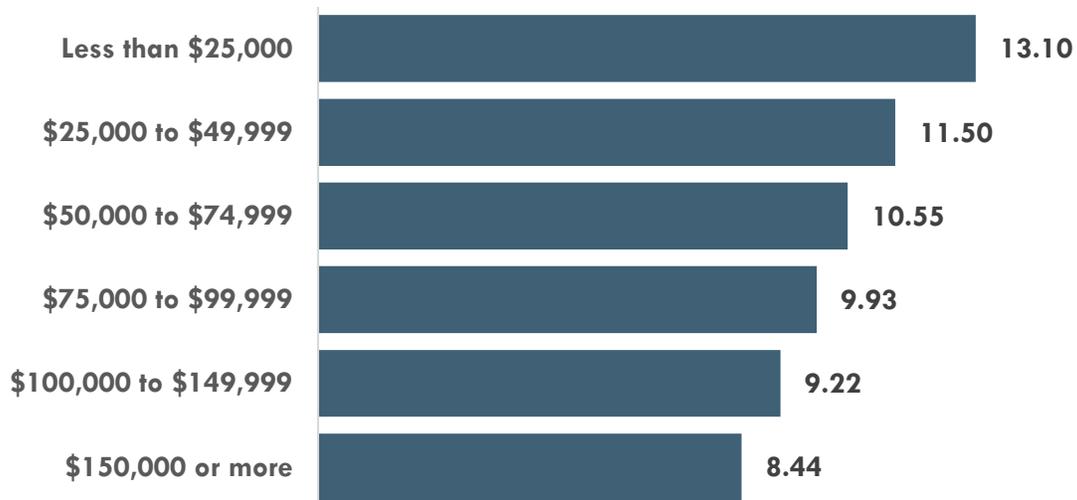
Sources: Federal Highway Administration National Household Travel Survey, 2017; BERK, 2021.

Note: NHTS results may not be representative of Washington state households as a whole as the survey was not designed to be representative at the state level.

Figure 3-10 Household Vehicle Types by Household Income, Washington Households

3.2.4 How Does Vehicle Age Vary by Household Income?

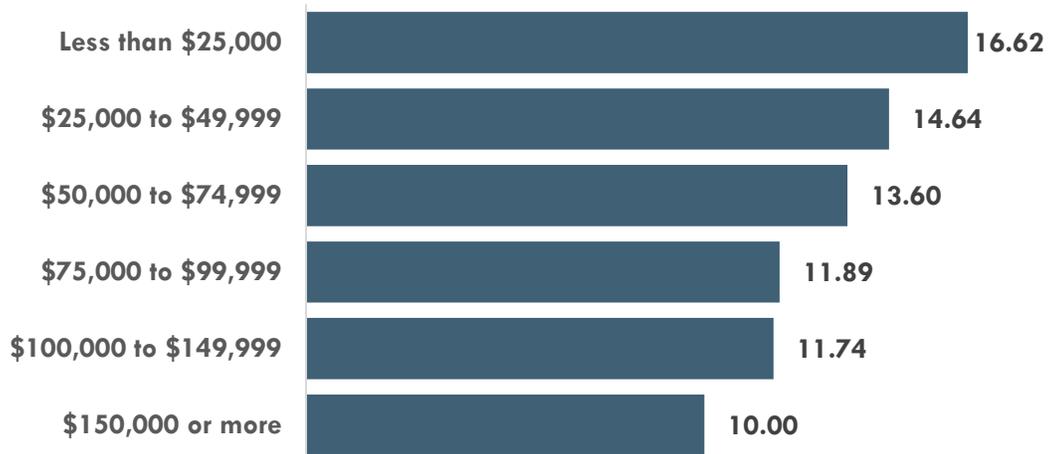
Figure 3-11 shows the average age of personal vehicles based on household incomes in the U.S. The national data suggest that there is a **negative correlation between vehicle age and income; the lower one’s household income, the older the vehicle(s) in the household.**



Sources: Federal Highway Administration National Household Travel Survey, 2017; BERK, 2021.

Figure 3-11 Average Age of Personal Vehicle by Household Income, Vehicles in U.S. Households (N=256,115)

Similar to the national dataset, **Figure 3-12** showing Washington households suggests that **lower income respondent households tend to have older vehicles**, compared with higher income households. Households with annual incomes of less than \$25,000 drive vehicles with an average age of 16.62 years, while households with annual incomes of over \$150,000 drive vehicles with an average age of 10.00 years.



Sources: National Household Travel Survey, 2017; BERK, 2021.

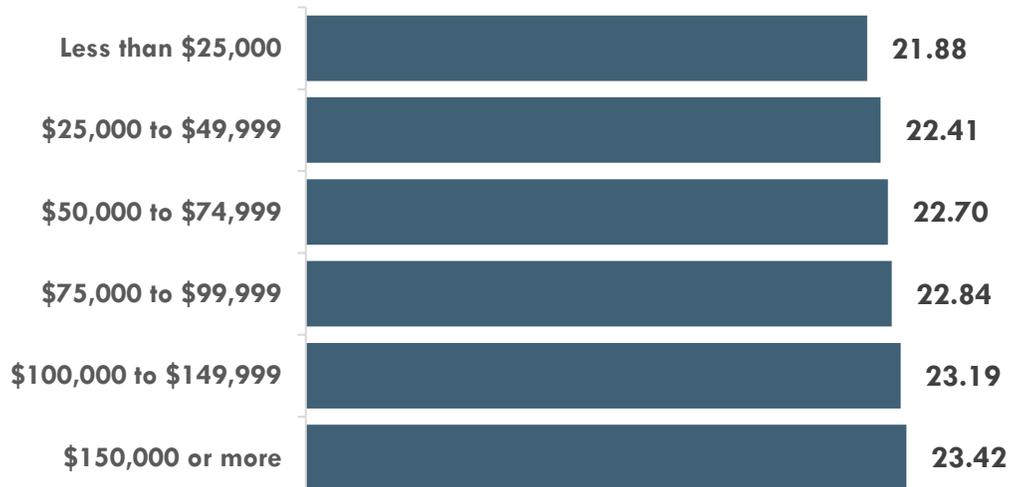
Note: NHTS results may not be representative of Washington state households as a whole as the survey was not designed to be representative at the state level. Households without vehicles have been removed from this analysis.

Figure 3-12 Average Age of Personal Vehicle by Household Income, Vehicles in Washington Households (N=1,306)

3.2.5 How Does Vehicle Fuel Economy Vary by Household Income?

The previous analysis shows that 1) lower income respondent households in Washington tend to drive a higher proportion of cars, a lower proportion of SUVs, and higher proportion of pickup trucks; and 2) lower income respondent households tend to drive older vehicles. Because cars are more fuel efficient while pickup trucks are less fuel efficient, together, these two findings mean there is **no clear trend between household incomes and household vehicle fuel economy among the NHTS’s 620 respondent households from Washington (Figure 3-14).**

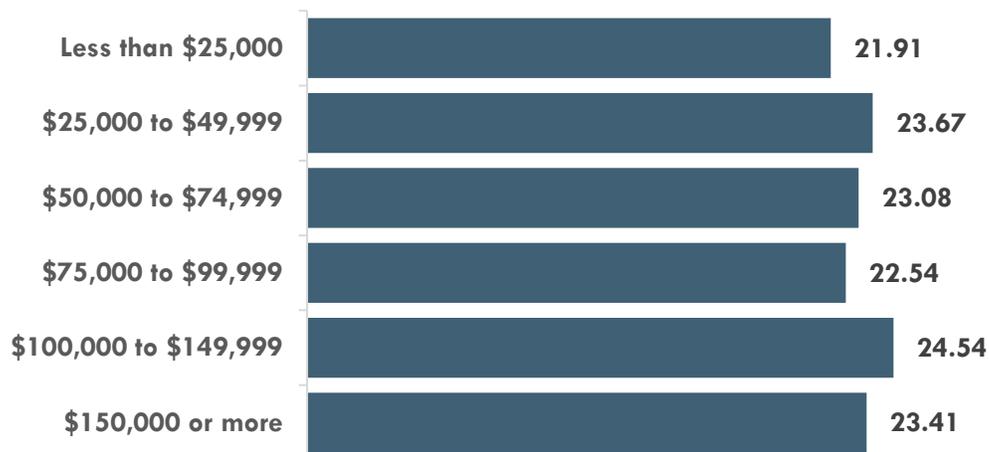
At the national level, shown in **Figure 3-13**, the data suggests a slight but consistent trend between household income and fuel economy; however, the national dataset may not be representative of Washington drivers.



Sources: Federal Highway Administration National Household Travel Survey, 2017; BERK, 2021.

Note: Households without vehicles have been removed from this analysis.

Figure 3-13 Average Fuel Efficiency (in MPG) of All Household Personal Vehicles by Household Income, U.S. Households (N=123,447)



Sources: National Household Travel Survey, 2017; BERK, 2021.

Note: NHTS results may not be representative of Washington state households as a whole as the survey was not designed to be representative at the state level. Households without vehicles have been removed from this analysis.

Figure 3-14 Average Fuel Efficiency (in MPG) of All Household Personal Vehicles by Household Income, Washington Households (N=620)

3.3 Vehicle Miles Traveled

Vehicle fuel economy, discussed in the previous section, is one factor that contributes to a household’s gas tax costs. Miles driven per year, or VMT, is the other. This section explores how VMT varies across Washington and U.S. households.

3.3.1 How Many Miles Do Washington Drivers and Households Tend to Drive Per Year?

Figure 3-15 summarizes average VMT by vehicle type. Washington drivers are **driving fewer miles** than U.S. drivers in general. The ratio of average VMT per vehicle in Washington compared with the U.S. is around 0.7 for passenger cars and trucks, and lower for buses and motorcycles.

Washington State

	Passenger Cars (incl. pickups & SUVs)	Trucks	Buses	Motorcycles
Total VMT	56,713,735,936	5,448,866,236	227,010,036	147,587,792
Registered vehicles	6,756,390	363,703	24,563	232,371
Average VMT per vehicle	8,394	14,982	9,242	635

United States

	Passenger Cars (incl. Pickups and SUVs)	Trucks (Single-unit and Combination)	Buses	Motorcycles
Total VMT	2,924,053,220,366	300,050,408,534	17,979,988,907	19,688,045,034
Registered vehicles	252,530,488	14,369,339	995,033	8,596,314
Average VMT per vehicle	11,579	20,881	18,070	2,290

WA to US ratio:	0.725	0.717	0.511	0.277
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Sources: Federal Highway Administration Highway Statistics Series, 2019; Washington State Department of Transportation, 2019; BERK, 2021.

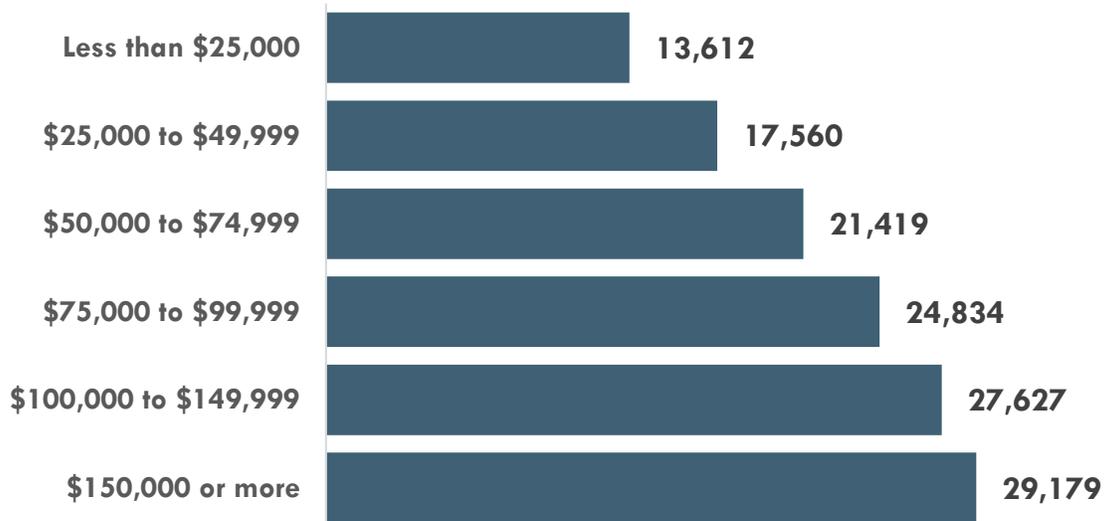
Figure 3-15 Average Vehicle Miles Traveled by Vehicle Type, U.S. Vehicles, 2019

Figure 3-16 and **Figure 3-17** summarize average VMT of personal vehicles in each household, based on household income, across the U.S. and in Washington. It is important to note that Washington results may not be representative of Washington households as a whole as the NHTS was not designed to be statistically representative at the state level.

The VMT totals in these figures are higher than those in the previous figures because **Figure 3-15** shows VMT per vehicle, while **Figure 3-15** and **Figure 3-16** show average VMT per household; households may have multiple vehicles.

Again, the data shows that Washington respondents drive fewer miles than U.S. respondents in general.

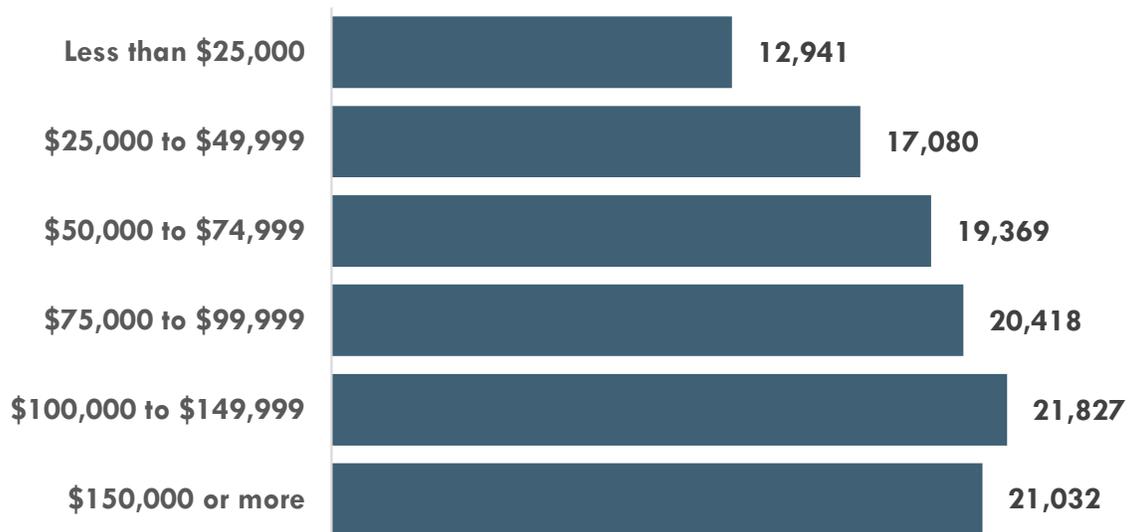
In general, **Figure 3-16** and **Figure 3-17** suggest that higher income respondent households tend to drive more than lower income households.



Sources: National Household Travel Survey, 2017; BERK, 2021.

Note: Households without vehicles have been removed from this analysis.

Figure 3-16 Average Vehicle Miles Traveled of All Household Personal Vehicles by Household Income, U.S. Households (N=123,447)



Sources: National Household Travel Survey, 2017; BERK, 2021.

Note: NHTS results may not be representative of Washington state households as a whole as the survey was not designed to be representative at the state level. Households without vehicles have been removed from this analysis.

Figure 3-17 Average Vehicle Miles Traveled of All Household Personal Vehicles by Household Income, Washington Households (N=620)

3.4 Cost Paid Under Gas Tax vs. RUC

3.4.1 Would Households in Various Income Brackets Pay More or Less Under A Potential Road Usage Charge Compared to the Gas Tax?

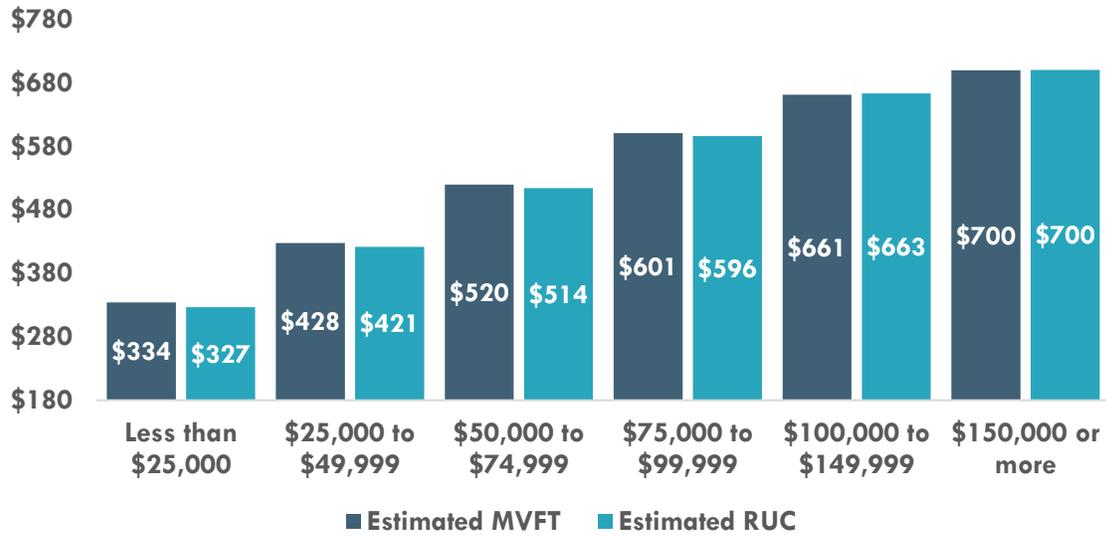
Figure 3-18 and **Figure 3-19** show the estimated costs among households in the NHTS data set for the current gas tax as well as under a proposed RUC, for the U.S. and Washington state. It is important to again note that NHTS data may not be representative of Washington households given that the NHTS was not designed to support state-level analysis. As a result, U.S. findings are shown for contextual purposes. The data show a clear trend at the national level, with lower income households paying less in RUC than under a gas tax, and higher income households paying the same or more in RUC than under a gas tax.

Within Washington, the results are mixed: At the state level for Washington, results between income brackets are mixed: the lowest-income households (under \$25,000) pay less under RUC, while households with incomes between \$25,000 and \$74,999 pay more. Households from \$75,000 to \$99,999 would pay less under RUC, while households between \$100,000 and \$149,999 and in the highest bracket (over \$150,000) would pay more.

The most any one income bracket would save under RUC, on average, is \$8 per year for the lowest income bracket (a savings of 2 percent). The largest increase any one income bracket would see under RUC, on average, is \$20 per year for the income bracket \$100,000 to \$149,999 (a 4 percent increase). Given the relatively small differences in average cost increases and cost savings, and the relatively small sample sizes of households, **there is no statistically significant difference in how much the household would pay under a RUC compared with the gas tax.** In other words, the differences shown in what households pay by income in **Figure 3-19** and **Figure 3-20** are so small that, extrapolated to the population as a whole, we must assume the average difference is statistically no different from zero.

3.4.2 Why is this True?

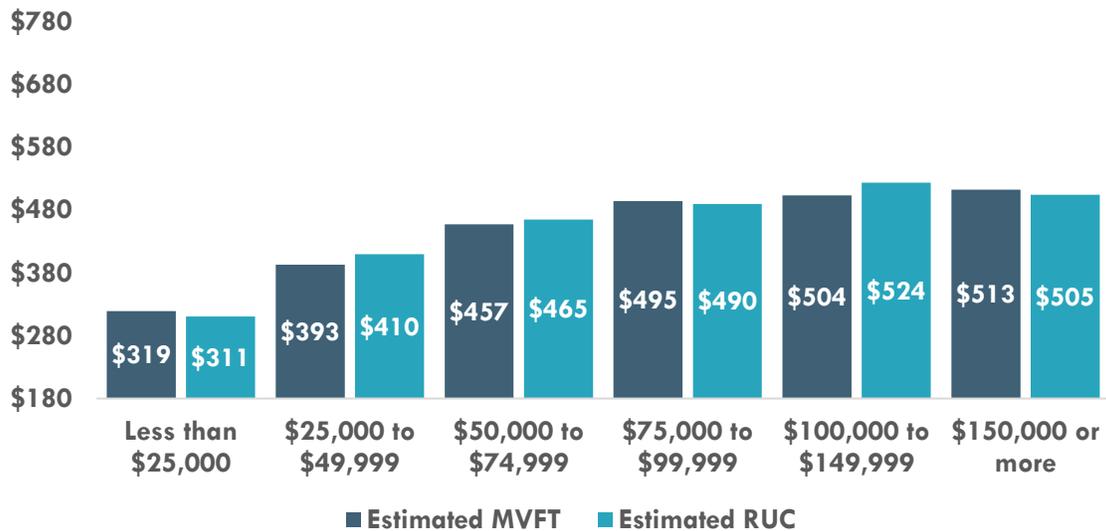
- On a per mile basis, the difference between gas tax and RUC costs are completely determined by fuel economy. For two households driving the same number of miles, fuel economy determines the difference between what the two households would pay in gas tax on an annual basis. The household with the less fuel-efficient car will pay more in gas taxes to drive the same amount of miles. Under a RUC, by contrast, both households would pay the same. As a result, since fuel economy does not appear to meaningfully vary by income, the average costs paid under gas tax and RUC across income brackets likewise do not vary.



Sources: Federal Highway Administration National Household Travel Survey, 2017; BERK, 2021.

Note: Households without vehicles have been removed from this analysis

Figure 3-18 Estimated Average Motor Vehicle Fuel Tax vs. Road Usage Charge Paid by Income Bracket, U.S. Households (N=123,447)



Sources: Federal Highway Administration National Household Travel Survey, 2017; BERK, 2021.

Note: NHTS results may not be representative of Washington state households as a whole as the survey was not designed to be representative at the state level. Households without vehicles have been removed from this analysis.

Figure 3-19 Estimated Average Motor Vehicle Fuel Tax vs. Road Usage Charge Paid by Income Bracket, Washington Households (N=620)



Figure 3-20 Income vs. Fuel Economy by Census Tract

Following the inconclusive findings from NHTS, the project team developed an alternative approach to addressing the question of how RUC would compare to the gas tax by income level. The approach aimed to estimate the income level of individual vehicles in the state, or at least the average income of geographic groups of vehicles. First, the project team received VINs from DOL for all light-duty vehicles in the state as of July 2021, along with the Census tract to which each VIN is registered. The 17-digit standard VIN encoded a wealth of data about a vehicle, including its make, model, model year, trim, manufacturer’s suggested retail price, and EPA fuel economy ratings. The project team successfully decoded 89 percent of the VINs provided by DOL and matched them to EPA city, highway, and combined fuel economy ratings. Vehicles not successfully matched included those older than 1984 (prior to which there are no EPA fuel economy ratings) as well as vehicles with nonstandard VINs or incorrect data entries.

Next, the project team calculated the average fuel economy for each of Washington’s 1,774 Census tracts. Larger than a block group but smaller than most ZIP codes, Census tracts tend to be relatively homogeneous socioeconomically. There is a sharp variation across Census tracts by factors such as income, percent ethnic minority status, and education level. Drawing on Census data, the project team calculated additional socio-economic and demographic factors, notably average household income.

In comparing average fuel economy for all vehicles in a Census tract to average income, the project team found vehicles registered in 1,442 tracts and measured a strong, positive, statistically significant

correlation between the two variables. Statistically significant means that the correlation between Census tract income levels and fuel economies is statistically different from zero with a confidence level of 95 percent. Positive correlation means that, although no *causal* relationship can be inferred, we observe that as income increases, so does fuel economy. The 1,442 tracts included in the study had an average of 1,975 households and 5,003 residents.

The scatterplot below illustrates this correlation visually. Each dot on the plot represents one Census tract. The further to the right on the plot, the higher the average income of the households in the tract. The closer to the top of the plot, the higher the average fuel economy of vehicles registered in the tract. The dots fall on an axis moving from lower left to upper right, as indicated by the trend line that fits the dots. The lines illustrates the general trend of increasing fuel economy with increasing income. There are outliers. For example, the dot in the upper left corner represents a tract with an average MPG of 24.7 and average income of about \$34,000. It turns out this particular tract has one of the lowest average ages in the states, at just 21.9 years. Despite the variability of individual tracts, the general trend supports the hypotheses that lower-income households tend to drive less fuel-efficient cars on average. Therefore, they would save under a RUC, on average.

The vehicle economy and income data by Census tract also allowed the project team to explore how much RUC would cost compared to the gas tax by income levels. **Figure 3-21** illustrates the amount paid in state fuel taxes per 10,000 miles of driving by the average vehicle registered in a Census tract of each income level. Vehicles registered in Census tracts with incomes averaging below \$50,000 average 20.01 MPG, which corresponds to state fuel taxes of \$247 for every 10,000 miles driven. As income increases, so does MPG, meaning a reduction in state fuel taxes. Vehicles registered in Census tracts with an average household income above \$150,000 pay an average of \$218 in state fuel taxes per 10,000 miles driven, \$29 less than those in the lowest income bracket. A RUC would equalize payments for all households. At 2.4 cents per mile, all vehicles would pay \$240, which is \$7 less for those registered in the lowest income bracket Census tracts, while those in the highest income Census tracts would pay \$22 more.

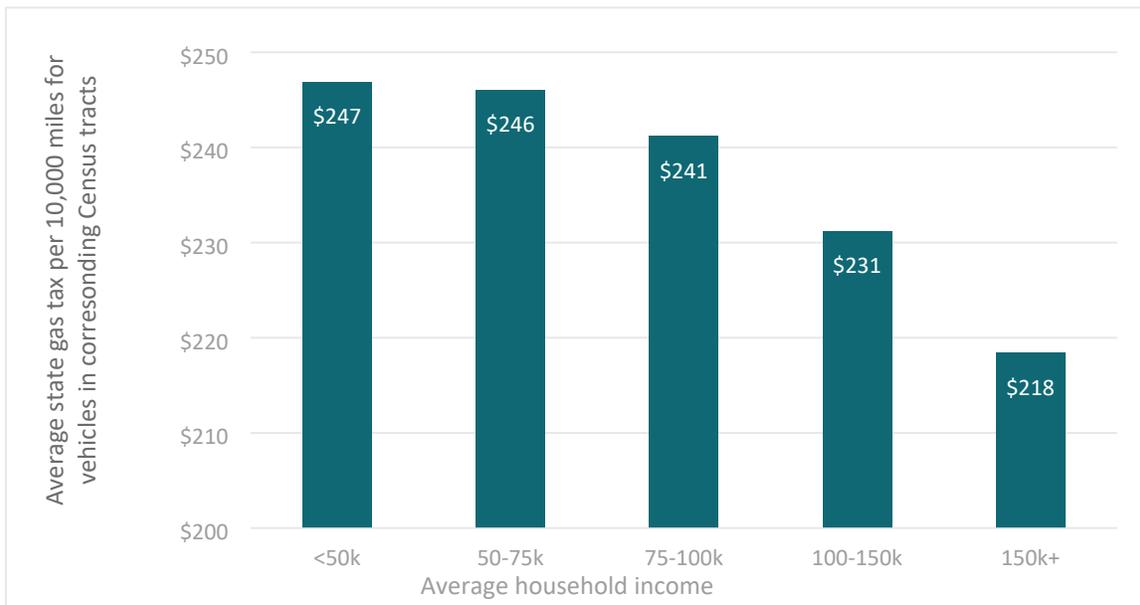
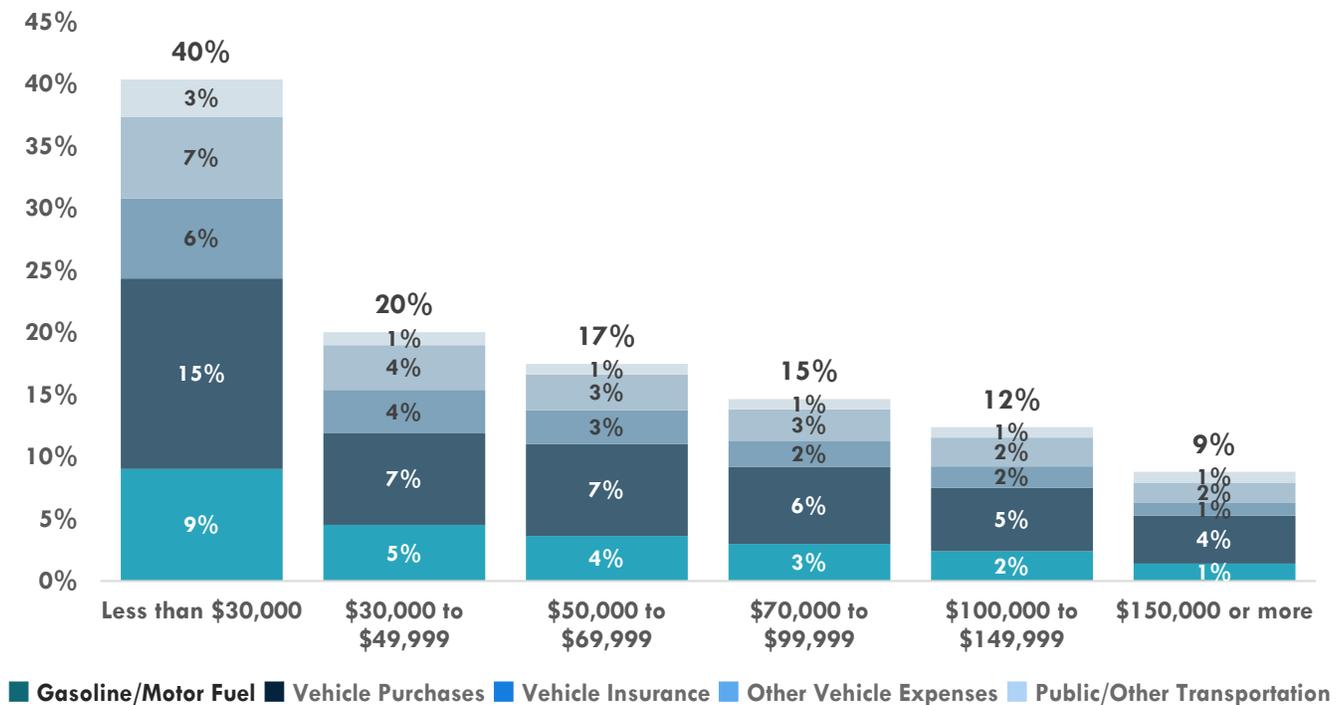


Figure 3-21 Average State Gas Tax Paid by Vehicles by Census Tract Income Bracket

3.4.3 What Percentage of Household Income Is Spent on Transportation Costs?

As of 2019, data from the Bureau of Labor Statistics Consumer Expenditure Survey shows that an average U.S. household spends around 13 percent of its household income on transportation costs. Transportation costs include vehicle purchases, gasoline and other motor vehicle fuel costs, maintenance and repairs of vehicles, vehicle insurance, vehicle finance charges, and public transportation or other transportation costs. Gasoline and other motor vehicle fuel costs represent around 2.5 percent of an average U.S. household’s annual income. Unsurprisingly, the portion of a U.S. household’s income, on average, that is devoted to transportation varies by income level. As with any consumer expenditure, lower income households tend to spend a higher proportion of income on transportation. **Figure 3-22** below details the average percentage of household income spent on transportation costs by income level for U.S. households, while **Figure 3-23** shows the percentage spent on fuel taxes specifically. Looking specifically at the tax component of fuel costs, households spend between 0.2 percent of income (for the highest income households) and 1.4 percent (for the lowest income households) on fuel taxes.



Sources: Bureau of Labor Statistics Consumer Expenditure Survey, 2019; BERK, 2021.

Figure 3-22 Percentage of Household Income Spent on Transportation by Income, 2019, U.S. Households

	Less than \$30,000	\$30,000 to \$49,999	\$50,000 to \$69,999	\$70,000 to \$99,999	\$100,000 to \$149,999	\$150,000 or more
% of Income Estimated to be Spent on WA State Gas Tax	1.4%	0.7%	0.6%	0.5%	0.4%	0.2%

Figure 3-23 Percentage of Household Income Spent on Fuel Taxes by Income, 2019, U.S. Households

For households with incomes of less than \$30,000, transportation costs represent around 40 percent of household annual income, on average.

- Gasoline or other motor vehicle fuel purchases represent around 9 percent of household annual income, on average.
- Based on 2019 fuel price information from WSDOT, a gas tax rate of \$0.494 is estimated to represent around 1.4 percent of household annual income on average, for households at this income level.
- Other state taxes represent a larger share of household income than gas taxes. Sales taxes, for example, represent two to three times the amount spent on fuel taxes, while property taxes account for as much as five times the average amount spent on fuel taxes.³

For households making \$150,000 or more, transportation costs only represent around 8 percent of household annual income, on average.

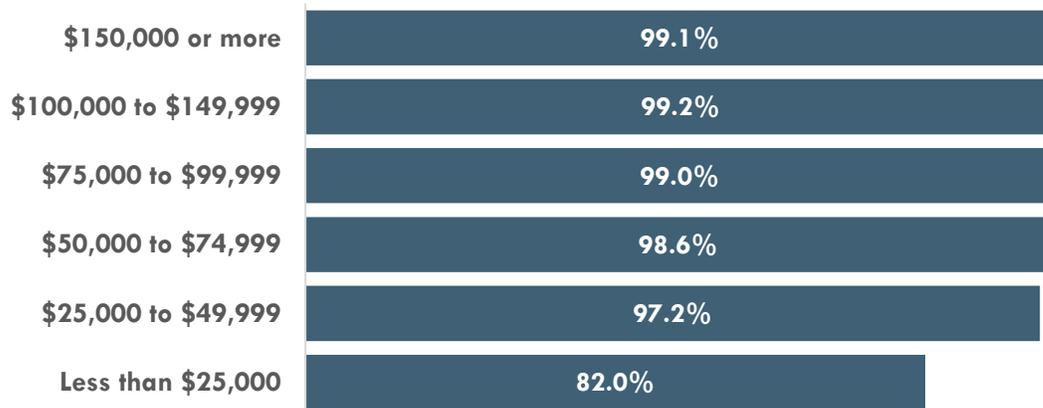
- Gasoline or other motor vehicle fuel purchases only represent around 1 percent of household annual income, on average.
- Based on 2019 fuel price information from WSDOT, a gas tax rate of \$0.494 is estimated to represent around only 0.2 percent of household annual income, on average, for households at this income level.

In some regions in the state, significant portions of households make above \$150,000. For example, in the Seattle area over 28 percent of households make \$150,000 or more.

3.4.4 Who Owns A Vehicle? How Does Vehicle Ownership Correspond With Income Levels?

According to the NHTS, as of 2017, around 95 percent of U.S. households own a household vehicle. Data suggests that vehicle ownership does vary between income levels. **Figure 3-24** below outlines the vehicle ownership by income level for U.S. households.

³ Calculated using Smart Asset, assuming a married household in Seattle earning \$30,000 per year.



Sources: Federal Highway Administration National Household Travel Survey, 2017; BERK, 2021.

Figure 3-24 Percentage of Vehicle Ownership by Income, 2017, U.S. Households

As shown above, U.S. households have very high rates of vehicle ownership, on average. As an example, around 99 percent of households making \$50,000 and above have access to a vehicle and around 97 percent of households making between \$25,000 to \$49,999 have access to a vehicle. The majority of households on the lowest end of the income spectrum own vehicles though at lower rates than higher-income households. Around 82 percent of households making below \$25,000 have access to a vehicle.

3.4.5 Who Owns an Electric Vehicle?

In 2020, EV registrations in the U.S. reached a market share of 1.8 percent, a record high. EV market share is highest in the Western Region of the U.S., where 4.8 percent of all new vehicles registered are EVs. As of May 2021, there are over 73,000 EVs registered in Washington, an increase of around 72 percent from EV registrations as of December 2018 (around 43,000 EV registrations).^{4,5} All these trends suggest that U.S. consumers, particularly those in Washington and the rest the western U.S., are showing increasing interest in EVs.

However, data suggests that EVs are disproportionately purchased and owned by high income customers. According to a 2019 study by the Congressional Research Service about the plug-in EV tax credit, 78 percent of EV tax credits were claimed by filers with an adjusted gross income (AGI) of \$100,000 or more.⁶ For context, only about 17 percent of total tax filings have an AGI of \$100,000 or more. Moreover, about 7 percent of credits claimed were claimed by filers with a AGI of \$1 million or more – only about 0.3 percent of total tax filings have an AGI of \$1 million or more.

⁴ <https://data.wa.gov/Transportation/Electric-Vehicle-Population-Data/f6w7-q2d2>.

⁵ http://www.westcoastgreenhighway.com/pdfs/Map_WAEVRegistrationByCounty.pdf.

⁶ <https://fas.org/sqp/crs/misc/IF11017.pdf>.

Data from DOL confirms that in Washington, EVs are much more likely to be registered in Census tracts with higher incomes. As **Figure 3-25** shows, EVs represent over 5 percent of vehicle registrations in Census tracts where the average income is over \$200,000, making them more than 10 times as likely than in Census tracts with average incomes below \$50,000. A similar trend is observed for hybrid vehicles, with higher rates of hybrid ownership in areas with higher average incomes than areas with lower average incomes.

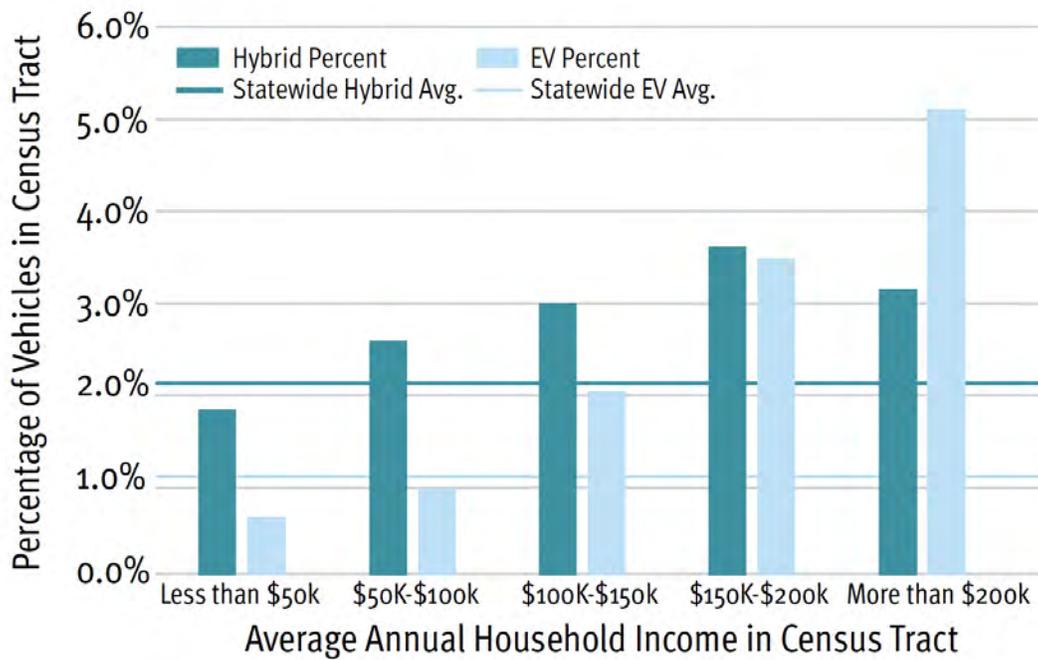


Figure 3-25 EV Registration Rates by Income

4.0 CONCLUSION

This section provides information about the potential equity implications of Washington transitioning from a gas tax to a RUC. This analysis focused on vertical equity (ability to pay) and specifically explored the following questions:

- Would households in different income brackets pay more or less under a potential RUC, compared with the gas tax?

4.1 Low-income Households

In Washington, there are several different measures used by agencies to define whether an individual or household is considered “low-income.” There is no one definition for a “low-income” household. In our analysis, we do not use one specific definition for “low-income” but rather describe findings based on income brackets.

Next, we analyzed where lower income households live by geographic category of urban incorporated, UGA, or rural. We found that on the west side of the state, there is **no disproportional representation by urban or rural households in any income bracket**. On the east side, there are a **larger share of rural households in the highest income bracket**, but there are fewer total number of households of any geographic category in the highest income bracket.

Looking at how incomes correspond with race and ethnicity in Washington, we found that White households and multiracial households are relatively evenly distributed across the income spectrum. Black households and AIAN households are overrepresented among lower income groups and underrepresented among higher income groups. Asian American households are underrepresented among lower income groups and overrepresented among higher income groups. The distribution of Hispanic households and households identifying as another race across income groups follows a version of a bell curve, with these households more concentrated among the middle-income groups of \$25,000 to \$74,999 and less concentrated in the lowest income and highest income groups.

4.2 Vehicle Trends

Next, examining the trends between fuel economy and vehicle types, we found that fuel economy varies across vehicle types. Cars are more fuel efficient, while SUVs and pickup trucks are less fuel efficient. Looking at the relationship between vehicle age and fuel efficiency, older vehicles do tend to be less fuel efficient. As of 2019, cars are still the most prevalent vehicle in the Washington fleet (40 percent of the Washington fleet). However, SUVs have seen by far the most significant growth over the past several years. From 2014 to 2019, the number of registered SUVs increased by 44 percent, compared to 11 percent for pickups and vans and just 7 percent for cars.

4.3 Household Incomes and Vehicles

Based on the analysis of vehicle type, age, and fuel economy, we examined whether there are trends between households’ incomes and the types, ages, and fuel economy of households’ vehicles. The analysis showed that lower-income households have a higher proportion of cars, a lower proportion of SUVs, and a higher proportion of pickup trucks. Cars are more fuel efficient, while pickup trucks are less fuel efficient. At the same time, lower income households tend to have older vehicles. Because of these two findings, there is **no clear trend in NHTS data between household incomes and fuel**

economy of their vehicles in Washington. However, DOL data reveal a statistically significant relationship between average fuel economy and average income by Census tract: **areas with higher incomes tend to have higher average fuel economy and much higher rates of EV and hybrid vehicle registrations.**

4.4 Washington Drivers

Because this analysis draws from both U.S. drivers and Washington drivers, we wanted to understand the driving habits of Washington drivers. Washington drivers are **driving fewer miles** than U.S. drivers in general. The ratio of average VMT per vehicle in Washington compared with the U.S. is around 0.7 for passenger cars and trucks, and lower for buses and motorcycles. The analysis also shows that **higher income respondent households tend to drive** more miles than lower income respondent households.

4.5 Cost Paid Under Gas Tax vs Road Usage Charge

In general, when looking at respondent information from the NHTS at both the national and Washington state level, estimated costs under the current gas tax and under a proposed RUC are **relatively similar, on average.**

Differences between the estimated cost per household under gas tax versus RUC are found to be **not statistically significant for any of the income brackets, in both the Washington state and national data from NHTS.** This means that we *cannot* conclude that the small⁷ differences observed in estimated gas tax and RUC costs among the NHTS respondent households would exist across the Washington state or U.S. populations as a whole. However, from DOL data, we can conclude that **vehicles registered in low-income areas would save, on average, under a RUC compared to a gas tax, while vehicles registered in higher-income areas would, on average, pay more.**

⁷ The largest difference is \$20 a year, for Washington state households with incomes between \$100,000 and \$149,999.

PART TWO: QUALITATIVE FOCUS GROUPS

1.0 INTRODUCTION

Given that a RUC has implications beyond whether households can expect to pay less, the same, or more than they currently pay in gas taxes, the WSTC commissioned a series of focus groups to explore transportation funding and RUC with participants to hear their perspectives, questions, and potential solutions. These discussions, led by Yates Consulting, yielded insights into what people know now about gas taxes, including the amount they believe they pay, what concepts they support for transportation funding, their questions about a RUC and how it would work, potential barriers related to language and usability, and other topics.

A key objective of these focus groups was to hear from residents who are not typically consulted or represented in policy discussions.

2.0 APPROACH

Our charge was to reach out through focus groups to as many diverse groups across the state as possible. Our overall strategy was to contact a variety of organizations whose members were “communities of color, low-income households, vulnerable populations, and displaced communities,” which are the groups identified in the proviso directing the WSTC to conduct research into the equity implications of a RUC.

We sought diversity in race, ethnicity, age, culture, physical abilities, gender, income, geography, and thought. Initially, we researched close to two hundred organizations to meet our criteria. We held focus groups with seventeen organizations, in-person when COVID-19 directives and social distancing allowed, and online when that was the only option. The in-person groups allowed us easy back and forth conversation without distraction, and a real sense of the group’s ideas. The online focus groups made for easier, more convenient participation. Those groups (mostly using the Zoom platform) yielded answers to the questions asked, but we observed that participants in the in-person groups gave more thought to their answers. Our focus groups consisted of an average of nine people, the smallest being three participants and the largest fifteen.

3.0 PARTICIPANTS

Table 3-1 lists the organizations, key demographics they represent, and number of participants at each session. Following that, we include several charts illustrating demographic and other participant characteristics.

Table 3-1 Organizations participating in focus groups

ORGANIZATION	DEMOGRAPHICS	PARTICIPANTS (#)
Ahora Construction	Construction workers of varying ethnicities	5
Bremerton NAACP	African Americans	7
Coalition of Immigrants, Refugees, & Communities of Color	Various ethnicities and races	4
COVID-19 Community Response Alliance Fund	Various ethnicities and races	7
Disability Rights Washington	Individuals living with disabilities in Western Washington.	9
Filipino Chamber of Commerce of the Pacific Northwest	Filipinos (both U.S. and non-U.S. born)	8
India Association of Western Washington	Asian Indian community	8
Kent/Renton African American Group	African Americans	9
Legacy of Equality Leadership and Organizing	Various ethnicities and races	7
Mi Centro	Latinas	3
Neighborhood House	Vietnamese immigrants	7
Refugee Women’s Alliance	Various ethnicities and races	10
Seattle Arab Festival Organization	Lebanese	4
Somali Family and Drivers	Many Uber and Lyft drivers and other members of the Somali community	14
Tri-Cities Group		8
Yakima County Development Association (2 sessions)	Latinx	19
TOTAL		129

3.1 How Focus Group Participants Were Identified and Recruited

We prepared a comprehensive list of more than 200 social service, civil rights, low-income support, refugee, community, and various ethnic-related organizations. The team then emailed a letter (See **Appendix D**) from the WSTC to the leaders of the identified groups. We followed up with telephone calls asking if the group was interested in participating in focus groups regarding transportation funding. In addition, the Yates Consulting team relied on past relationships to recruit organizations and their members to participate. As vaccines had not yet rolled out when we first made contact, many

organizations, while interested, asked for follow up in late summer as they were still addressing higher priority pandemic-related issues. These initial conversations also generated referrals to other organizations potentially interested and provided some initial insights into how quickly someone can understand the RUC concept after a short overview. What questions do they ask? What is not clear?

COVID-19 restrictions made it difficult to speak with individuals in some organizations we initially selected. In some cases, our calls were not returned due to offices being un-staffed. Other organizations had closed their doors permanently. Our goal was to ensure we held focus groups with individuals representing the larger ethnic groups – Asians and Hispanics. We also wanted to ensure that, in addition to African Americans, we heard from Black immigrant populations, many of whom drive professionally. While we sought feedback from these groups, we also selected participants based on their interest in being a part of a focus group on transportation funding. Some groups reached out to us, and we tried to accommodate them while working toward our demographic objectives. We believe that the desire to participate would have been more robust had it not been for COVID-19, and the fact that we approached organizations during the height of the pandemic.

Final recruitment occurred once our organizational contacts agreed to be part of a focus group. State Representative Sharon Tomiko-Santos and Office of Minority and Women Business Enterprises Director, Lisa van der Lugt, supported and aided our effort to recruit Asian and Hispanic groups.

3.2 How Focus Groups Were Conducted

We began our focus groups by briefly introducing ourselves and our objectives for bringing the group together. We then laid out the ground rules:

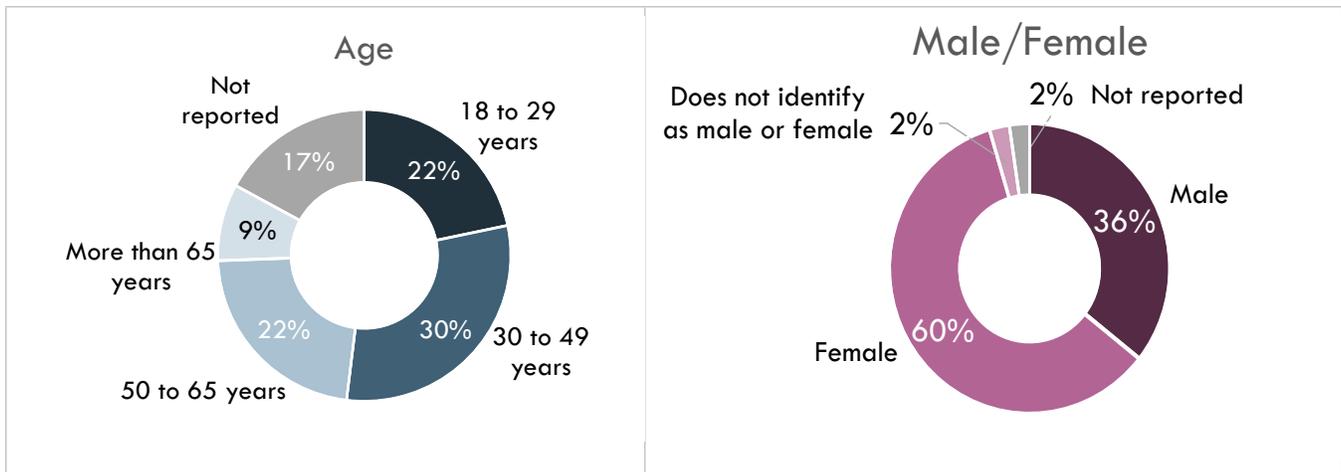
1. The focus group would be recorded, but only for the Yates Consulting team to ensure accuracy.
2. All comments would be anonymous, so we used first names only.
3. To ensure broad participation, we encouraged everyone to attempt to participate in answering all the questions.

Each focus group, virtual or in-person, went smoothly. We did encounter some language barriers with the Vietnamese and Somali groups. We used interpreters for the Vietnamese group, and it took more time to communicate answers. Some participants used multiple names, which other Vietnamese participants understood well, but we did not. In the case of the Somali group, several individuals had to have the questions explained to them verbally before answering. We enlisted the aid of a Somali interpreter to help assemble the group. After we asked the question of the entire group, he would go to individuals who did not understand and explain it to them further, sometimes in Somali. He told us later that the written format is not the best for some in his community and a more “verbally-based” interaction would have worked better.

Most often, group leaders, with whom we had made a connection, gathered participants (sometimes at the beginning of our meeting, sometimes before) and shared the purpose of the focus group. We explained to group leaders that the WSTC wanted anonymous opinions from often under-represented and low-income communities and suggestions on what possible solutions may be necessary to make transportation funding changes equitable. If asked before the focus group, we explained that we wanted participants to help the WSTC shape policy and program details for a future potential statewide RUC program. It was clear during the focus group proceedings that most participants had little knowledge of the RUC policy discussions.

To get to know our focus group members, we asked them to share their first names (to preserve anonymity), age range (**Figure 3-1**), ethnicity (**Figure 3-2**), gender, income range (**Figure 3-3**), and make and model of their primary vehicle(s). We then asked questions about a possible RUC in Washington, the fairness of such a charge, and any features that might make it more acceptable. We also asked questions about preferences on how to report miles driven and how to pay for those miles (see **Appendix E** for the Focus Group Discussion Guide).

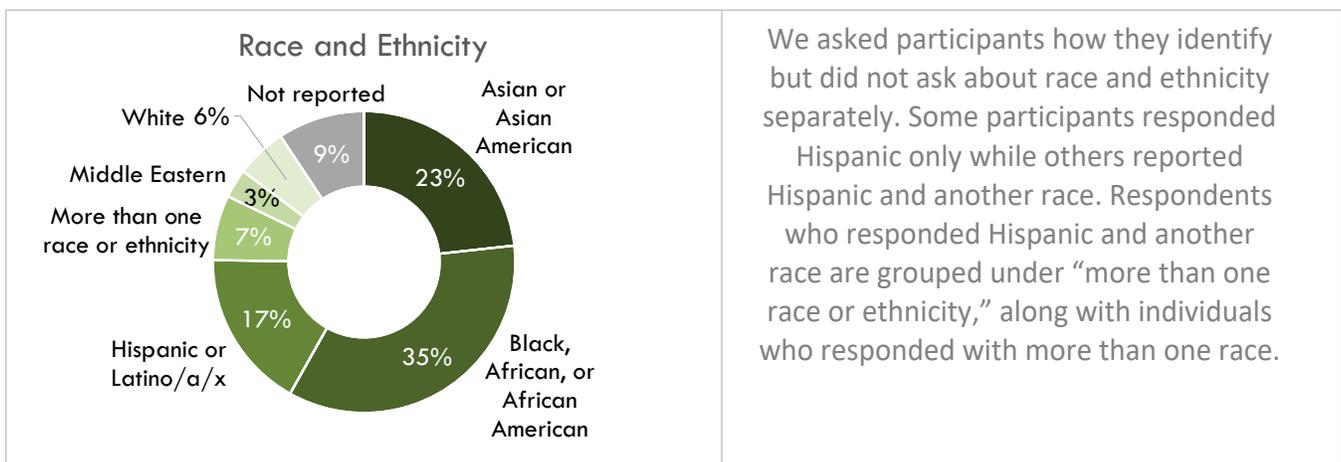
3.3 Participant Demographics



Source: Focus groups, 2021 and 2022.

Figure 3-1 Participants Were of Mixed Ages and More Participants Identified as Female

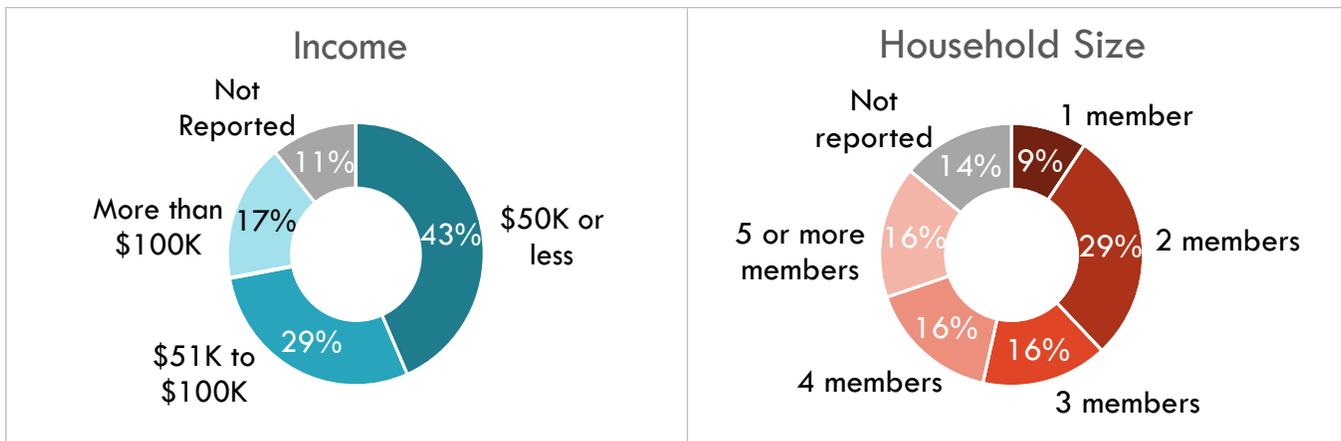
- Mix of ages with 52 percent 18 to 49 years of age
- More female participants than male or those that do not identify as male or female



Source: Focus groups, 2021 and 2022.

Figure 3-2 A Majority of Participants Were People of Color

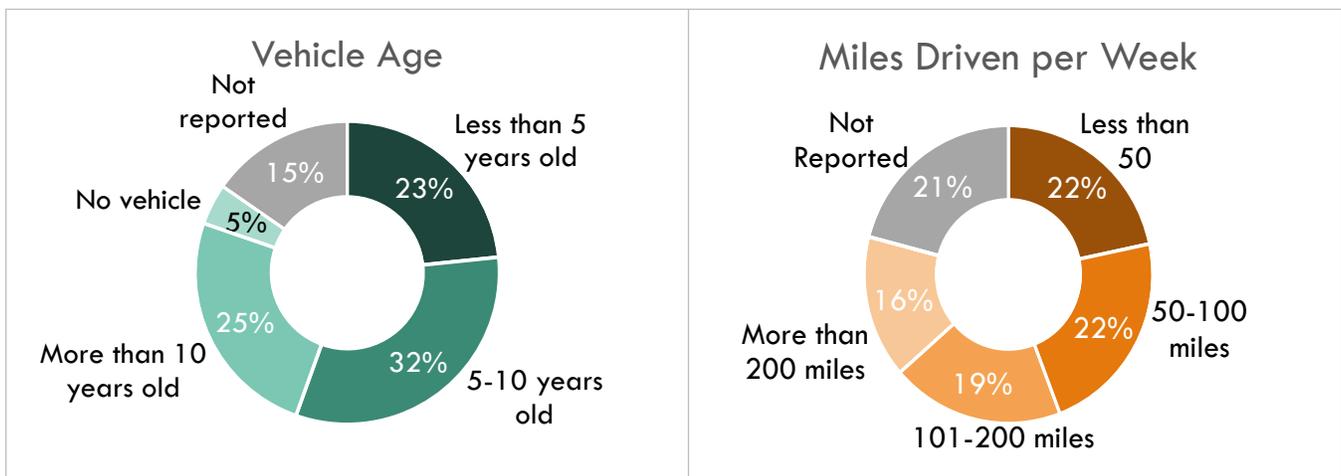
- Mix of races and ethnicities. Those who identify as Black, African, or African American made up the largest group at 35 percent, followed by those who identify as Asian or Asian American at 23 percent, and those that identify as Hispanic or Latino/a/x at 17 percent. See **Figure 3-2**.



Source: Focus groups, 2021 and 2022.

Figure 3-3 Participants Ranged by Household Size and Income

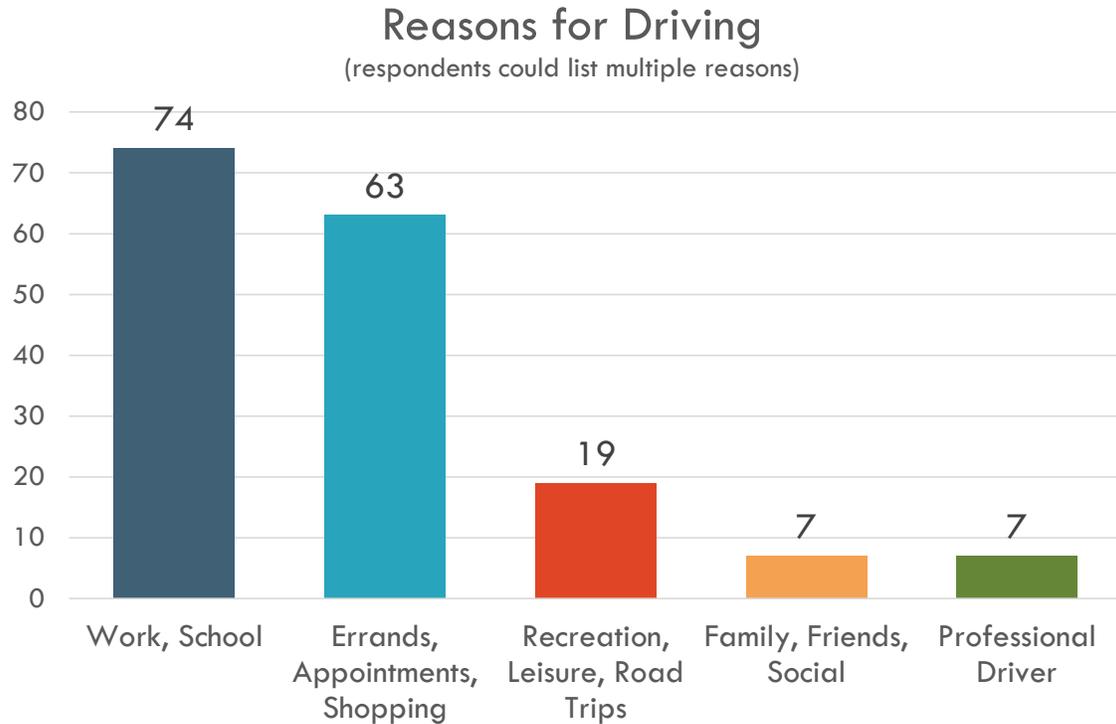
- Household sizes varied considerably, which has an impact on how far household income goes. While income shown above is not controlled by household size, the 43 percent of participants reporting \$50,000 or less would be considered low-income by any program definition.



Source: Focus groups, 2021 and 2022.

Figure 3-4 More Than Half of Vehicles are at Least 5 Years Old, and Participants Reported Varying Mileage

- The majority of participants have vehicles that are less than 10 years old. However, one-quarter (25 percent) have vehicles that are older than ten years. See **Figure 3-4**.
- The participants who reported having no vehicle participated in the Disability Rights Washington focus group
- While only 79 percent of respondents estimated their weekly driving mileage, 35 percent of respondents stated that they are driving over 100 miles a week and 16 percent said they are driving more than 200 miles (an average of at least 28.6 miles each day).



Source: Focus groups, 2021 and 2022.

Figure 3-5 Reasons for Driving Were Primarily Necessary Trips

- While participants could list multiple reasons for driving, two were selected far more than others: work and school; and errands, appointments, or shopping. Given that the focus groups were conducted during the COVID-19 pandemic, we suspect that pre-pandemic and possibly post-pandemic recreation and family, friends, and social trips would be higher than reported here. See **Figure 3-5**.
- 7 of the 129 participants were professional drivers.

4.0 FINDINGS

Baseline knowledge of how roads are funded in the state. When we asked each participant if they were aware of or had any familiarity with how Washington roads are paid for, maintained, and repaired. Most were unaware. However, many offered tolls, taxes (generically), or vehicle registration. We asked this question prior to any queries about RUC.

Initial perceptions. Most participants believe that it is vital to maintain the roads. That said, the majority concurred that a RUC would be regressive and unfair, especially to individuals and families with low incomes. That was the overarching sentiment regardless of the income, gender, occupation, or other characteristics of the participants. They also expressed concern that those with jobs which allow them to WFH could pay less than those who had to report to work and those who could not afford to live in cities close to their jobs.

Others hoped lawmakers would consider the environment and climate change. They contend that the better the roads, the more likely people are to drive on them, and that spending money to repair and maintain roads discourages drivers from using mass transit and other forms of transportation if the state had a better system. The fact that Yakima does not have an adequate bus system was mentioned several times in focus groups there. Below are some of the words focus group participants used to describe their initial perceptions of a RUC in Washington.

Participants' initial reactions relating to road maintenance costs and funding were primarily negative. They complained about pothole damage to their vehicles and took the opportunity to sound off about the inconvenience of delays due to construction, the cost of tolls, traffic in general, and the perception that the state does not do a good job managing the transportation funds it already has. This may have been because many participants did not understand the difference between state and locally funded roadways.

Latino carpenter, 18-29: *Regressive. Not a great thing for most people. But I understand the intent.*

On the plus side, most acknowledged roads need to be maintained and said they appreciate repaired, smooth roads.

Minimal understanding of all road funding. We asked participants how roads were currently funded. There were several answers (some confided they were guessing), but most did not have the slightest idea.

Not familiar.

Never thought about it.

I don't know how the system works.

State and federal dollars.

Annual license tabs.

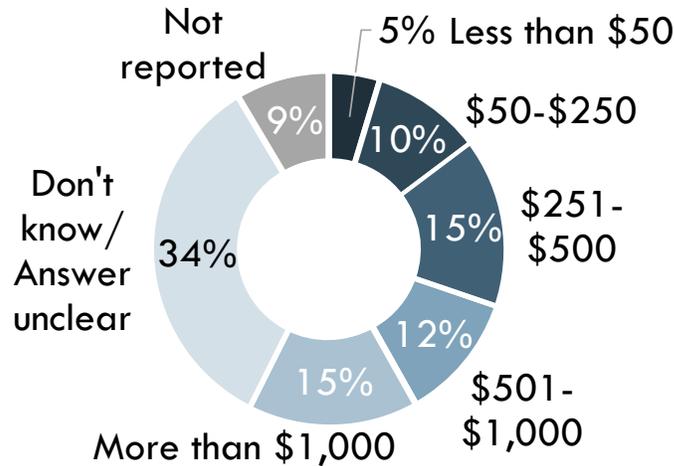
Taxes and tolls.

Gas tax perceptions. Once we explained that road construction, maintenance, and repair are paid for through gas taxes, we asked if participants knew their annual gas tax expenditure. Most did not know how much they pay, but at the same time, they believe whatever it is, it is excessive.

Female African American attorney, 30-49: *How much? Too much! More than other states.*

Guesses ranged from \$50 to \$3,000 annually. Because the gas tax is part of the price of gasoline, the complaints are that gas prices are too high. The answers shown in **Figure 4-1** reflect respondents' estimates of how much they pay annually in gas tax. Some respondents answered in formats that could not be translated into a dollar amount per year (e.g., a percentage). These are included under the "Don't know/Answer unclear" category, which also includes respondents who said they didn't know how much they paid in gas tax.

Estimate of Gas Tax Paid per Year



Source: Focus groups, 2021 and 2022.

Figure 4-1 Many Participants are Not Aware of How Much They Actually Pay in Annual Gas Taxes

Some participants believed the RUC would be an extra fee on top of the gas tax. In response, we indicated that the legislative intent thus far is for the RUC to replace the gas tax and stressed that this was the “generally accepted” scenario.

There was obvious resentment that taxes are already excessive and to raise them even higher would be unfair to everyone, but especially to families with low incomes and those who drive for a living such as Uber/Lyft drivers, food delivery drivers, and those who carry the tools of their trade in their cars, such as plumbers and carpenters.

Despite indicating the gas tax would be replaced by a RUC, the fact that there was a charge at all seemed onerous to many focus group members. Some were suspicious that this was another tax on the average worker.

Black legislative assistant, 50-65: *You are holding constituents hostage for using public roads.*

RUC Concept. Some focus group participants had heard of RUC in other countries. Some of the Yakima participants mentioned they had heard of the RUC because of a prior study conducted in the Tri-Cities. A woman who previously lived in London, England was familiar with the concept. Others mentioned hearing about such charges on the East Coast or in California. Some participants

associated a RUC with tolls charged for using east coast roadways. It was not the RUC itself that was objectionable. People were concerned about a charge on top of the gas tax, and, if a RUC is in the offing, how to make it work in Washington, specifically how to make it fair to everyone, including those with lower incomes.

White lower income homemaker, 30-49: *People who can't afford to live where they work and have longer commutes, should get a break. Our transit system is not adequate. On the other hand, people should fund their lifestyle. If they chose to live far away, they should pay.*

4.1 Positive Reactions to a Possible Road Usage Charge

Fair charge based on usage. Fairness was a key theme in our discussions. It seemed right to participants to charge people for what they use. The only caveats here were that those with electric or hybrid vehicles pay their share and that road repairs be equitable.

65-year-old, Black executive director: *Blacks and people of color are at a disadvantage because of inequities repairing the road and the communities in which the repairs take place.*

New funding source necessary in the near future. As more manufacturers move away from gas powered vehicles, the state will be required to find another way to build, maintain, and repair roads. A RUC would provide money for better, safer roads, and perhaps, fewer fatalities.

Filipino Contractor, 30-49: *May be necessary if the population continues to increase.*

Pay less if you drive less. Those who use multiple forms of transportation and who drive fewer miles would pay less.

White, Latina organizer, 30 - 49: *That people with electric vehicles will contribute money for infrastructure is important. This may lead to a more eco-friendly way to build roads, not relying on gas tax.*

Cambodian project engineer, 18-29: *People with gas cars will drive less.*

Ethiopian case manager, 50 - 65: *The advantage is there could be well maintained roads and more employment opportunities.*

Vietnamese social worker, 30-49: *It's good. If you drive more, you pay more.*

There was also an observation that with more people working from home, there might not be enough in the coffers to keep roads maintained and safe.

Lebanese educator, 50-65: *...may bring in less revenue over time because of work performed online.*

Several participants who recognized that roads must be repaired, while also stating taxes are too high, agreed to look more into the RUC concept. And they believe the state should provide more information to the public. All participants, with one exception, agreed to take part in any upcoming pilot programs.

While some participants were negative toward the RUC, most expressed a desire to learn more and to keep an open mind, which is reinforced by an almost unanimous desire to continue participating in the study. It is also important to note that several of our sessions went beyond the scheduled 90 minutes because some group members wanted to discuss the RUC issue further. One participant asked that we share the quantitative data with him.

Lower income, White woman, 65 or older: *It is hard to talk to advantages and disadvantages until we have seen the design.*

The request for more specificity about what the RUC would look like was discussed in most focus groups.

4.2 Reporting Preferences

Participants were asked which of the following five options they might prefer to record miles driven.

1. Device attached to the car that counts the number of miles driven automatically, with or without GPS. With GPS, you can exclude the number of miles you drive off road or out of state.
2. Smartphone app that counts the number of miles driven, with or without GPS
3. Licensed professional reads the odometer
4. You take a picture of your odometer and submit it using a mobile phone
5. Instead of counting miles, you pay a high lump sum to drive an unlimited number of miles annually.

When we asked how participants preferred to have their miles recorded, they were almost unanimous in their extreme dislike of “being tracked.” They implied the whole idea had an ‘Orwellian vibe’ and they had no interest in the state knowing where they were at any given time. Nor did they want a device attached to their vehicle.

White, Hispanic government worker, 30 - 49: *I don’t want to be tracked. Who would be in charge of my data?*

African American physical scientist, 50-65: *This idea may be good for the environment...but what about those who have to drive? The underserved and poorer populations who cannot work from home?*

Some argued that not everyone has a smartphone and that any smart devices, on principal, exclude “the very young, very old, and very poor.”

4.3 Payment Preferences

Participants were asked which of the following options they might prefer to pay for miles driven:

1. Pay the amount you owe with your vehicle registration *yearly*, using the same process you use to pay for vehicle registration.
2. Pay over the internet or using a phone app *yearly*, separate from the vehicle registration process.
3. Pay over the internet or using phone app *monthly*, separate from the vehicle registration process.
4. Fill a “driving wallet” with funds that are used to pay for your RUC as you drive. Any time your wallet falls below \$20, your bank account or credit/debit card is automatically charged to reload your wallet.
5. Pay in person at a retail location using cash, check, or money order.

Several people had concerns about the payment options especially if law enforcement becomes involved.

African American student, 18-29: *What if we can't pay? Will they take the car or arrest us?*

Ethiopian Uber driver, 30-49: *A flat rate makes sense for me.*

Cambodian Project Engineer, 27: *I don't like the invasion of privacy (using the tech options) and I think a driving wallet would save me money.*

White low-income Office Manager, 18 -29: *The monthly phone app is nice because you won't owe a ton at year end.*

African American Driver, 50-65 *The charge should be yearly, based on the weight of the car, and I want to pay on the internet or by phone.*

Ethiopian Security Guard, 50-65: *I don't like any of the payment options.*

Interestingly, some Uber and Lyft drivers liked the one-time fee for driving an unlimited number of miles because they put more than 100,000 miles on their vehicles in a year. When told that there may be some different options for commercial drivers, some pointed out that they use their cars for both personal and business purposes. The one-time lump sum option was also mentioned in Yakima as a good thing given the perception that people in that community driver longer distances than in other parts of the state.

5.0 POSSIBLE IMPROVEMENTS TO THE ROAD USAGE CHARGE CONCEPT

Focus group participants offered ideas to address perceived negative characteristics of a RUC. Most of the suggested ideas are directed at lessening the impact on individuals and households with low incomes. Every group interviewed was asked whether anyone would be disadvantaged by a RUC, and, if so, who? We then asked them to recommend ways to mitigate the impact. This topic was, by far, the one that generated the most discussion.

Some Yakima focus group participants suggested that RUC rates based on geographic differences would be appropriate because they believe that Yakima drivers live in rural communities and travel longer distances.

Listed below are mitigation ideas offered by participants:

- Lower taxes for those with lower incomes – instead of reducing the RUC amount, reduce current taxes on lower income households, possibly offering a rebate on federal income tax paid
- Establish a state income tax
- Tax based on wealth – road usage ought to be one factor to determine rate, but not the only determinate
- Base tax on income instead of mileage
- Income-based VMT
- Give a credit for RUC to people with low incomes
- Offer a variable discounted RUC fee based on income
- Totally exempt low-income people (not sure of the level of income needed for exemption) and those who are required to drive more
- Identify low-income zip codes and provide some sort of relief from the RUC
- Impose RUC only on certain days for individuals with low incomes
- Find a different way to raise money for road repair, construction, and maintenance
- Figure out a way to fairly tax everyone – Conduct an Environmental Impact Statement on the minority community
- Ensure additional information is provided to persons in low-income communities so they better understand the reason for the RUC
- Apply RUC to transit to help those who routinely use it – high proportion of low-income people on transit, but also persons living with disabilities
- Consider RUC funds for housing to get people living closer to jobs and transit
- Think tank to study the impact of RUC and make recommendations on mitigation
- Do not charge RUC for necessary travel (school, work, etc.)
- Provide options and never enforce payment requirement

- For companies with employees who must drive on the job, state should offer grants which would be passed on to the employee
- Whatever solution addresses low-income disadvantage it must be data driven
- State should invest in financial education to assist lower-income residents
- State should invest more dollars into areas needing mass transit

6.0 CONCLUSIONS

Several common themes emerged during these sessions which informs these conclusions. Foremost is the need to educate the public about transportation funding in general, and the gas tax, specifically. Almost no one in our groups knew the amount of the gas tax and what it currently costs the average driver. While many people understood that additional funds are needed to continue building, maintaining, and repairing roads and bridges, an equal number didn't understand this need. Participants see the increased number of EVs and hybrids and know carmakers will soon stop manufacturing gas powered vehicles. What they don't see is why that should affect them. There was a general belief that "those cars are for rich people." Many individuals with whom we spoke said they cannot afford a new car and their next vehicle will probably be used and gas powered. Explaining exactly what a RUC is, how it works, and how it might figure into Washington's future (and theirs) is paramount.

It was also apparent that there should be some mitigation to lessen the impact of a RUC on households with low incomes. Over and over we heard, "...those rich people can work from home (WFH). We have to leave our houses everyday..." to earn a living. Among other ideas, it was suggested that the state give rebates in certain ZIP codes, offer discounts to low-income residents, impose a RUC only on certain days, or exclude low income households altogether. We heard about an inadequate transportation system which does not support people with disabilities, that does not operate in certain neighborhoods, or operates on a limited schedule.

It was also obvious in some of our groups that any future efforts should have a format tailored to meet the needs of those for whom English is a second, or even third, language.

PART THREE: POTENTIAL SOLUTIONS

Analysis of the financial impacts of a RUC relative to the gas tax suggest that in terms of the amount paid annually, there are unlikely to be major changes, especially for low-income households. With the current gas tax, there is no discount or other way for low-income households to lower the amount they pay aside from driving less or not driving (where and when alternatives are available). However, given the discussion of rising costs and income inequality, it may be time to consider discounts for low-income drivers to help lower their costs.

An advantage of the gas tax is the ability to pay as you go (both from the perspectives of the consumer and the state receiving the tax). For households that need to manage finances carefully to cover all expenses, payment options that can mimic this pay as you go model to help with cash flow should be explored. This is likely to help both the consumer (taxpayer) and the State. Ongoing payments are easier for many households to budget and plan for than large annual bills and if households can plan for an affordable payments because they are manageable, it may help with compliance in terms of paying on time.

These two solutions geared towards reducing tax burden and mimicking the pay as you go model are described in more detail below.

Discounts to lower the cost of driving for low-income drivers. Foremost, although analysis found that low-income households would likely, on average, benefit under a RUC compared to the gas tax, perceptions persist that distance-based charging would disadvantage such households. This perception can be attributed to a belief that low-income household members must drive longer distances between affordable housing and workplaces, and to the fact that many such household members drive professionally for a living.

Under a RUC, unlike the gas tax, the possibility exists to target a rate discount for vehicle owners based on income. When enrolling a vehicle, collecting mileage data, or collecting RUC, the administering agency could validate the low-income status of the vehicle owner and apply a discount to the rate assessed. Such a program requires a number of system elements to process requests for discounts and perhaps validate eligibility. Such a program also requires user-facing elements and user actions to activate the discounts. To address questions about how to configure such a program to provide maximum benefit to end users in a cost-efficient manner, the Commission will field a simulation-based experience with real drivers, including many from the focus groups, to better understand preferences, behaviors, and concerns. In addition, the Commission will conduct additional research on possibilities for automated income verification in partnership with the Department of State Health Services.

Self-reporting miles driven at tab renewal. As with focus groups conducted with the general public in 2017, the focus groups conducted for this research confirmed many drivers are concerned about protecting privacy. They are also concerned about the possible complexity of mileage reporting. To address both of these concerns, the Commission will field a tab renewal-based RUC simulation and prototype, allowing customers to experience possibilities for reporting miles driven and paying at the time of vehicle registration renewal.

Payment options to mimic the pay as you go cash flow of the current gas tax. Finally, to address one of the drawbacks of tab-renewal-based RUC (large lump sum payments), the Commission will field a test of installment payment options to understand what choices are appealing and how best to remind customers to make subsequent payments, among other features and preferences.

The three potential solutions to address concerns of low-income drivers described above will be part of a broader test of RUC innovations. All of these tests will be conducted with the needs of low-income, disabled, and English as a second language customers in mind, from enrollment to customer service provision to invoice design. But the three concepts described above relate to specific feedback from participants in the field research, which merits further exploration and development of system design options for legislative consideration.

Appendix A: Impacts of a RUC on Urban and Rural Households

Review of RUC Studies on Impacts to Urban and Rural Households

Two studies looking at Washington state and the Western US have explored whether a potential transition from the gas tax to a RUC would disproportionately impact rural households.

In 2015, the WSTC studied the urban and rural financial and equity implications of a potential RUC system in Washington.⁸ The study compared estimated annual payments for personal light-duty vehicles under current gas tax rates and under a hypothetical RUC for urban and rural residents of Washington. The study assumes that gross revenue generated under a RUC would be the same as gas tax revenue for calendar year 2014.

The study is based on 1) a fuel consumption and VMT allocation model, 2) the Voice of Washington State (VOWS) survey panel on perceived vehicle miles driven and miles per gallon, and 3) Census Bureau and Bureau of Labor Statistics data on commute distances for rural and urban workers.

The study finds that:

- **The tax burden for each group does not appear to significantly change** with a switch from fuel taxes to a RUC. **Rural drivers would benefit slightly** from the change, and urban drivers would likely pay slightly more than they do in gas taxes. This is because rural residents tend to drive less fuel-efficient vehicles and more miles per year than residents living in urban areas.
- Rural drivers perceive higher miles driven than urban drivers/households. There are no significant differences between urban and rural in regard to *perceived* fuel economy of vehicles.
- More urban and rural individuals are commuting longer distances over the last ten years.

In 2017, RUC West analyzed the financial impacts of a RUC for urban and rural drivers in eight western states.⁹ The study used a revenue-neutral RUC rate that would generate the same total state tax revenue as currently provided by the gas tax.

The study uses data from the 2009 National Household Transportation Survey (NHTS) and the 2009-2013 American Community Survey (ACS) data. The study found that:

- Generally, rural residents drive older, less fuel-efficient vehicles, which increases gas taxes.
- Rural drivers tend to travel longer distances per trip but drive less frequently than urban drivers.
- Under a RUC, across eight states, rural households will pay 1.9%-6.3% less and urban households will pay 0.3%-1.4% more state tax under a RUC system than they would under the current state gas tax. This range reflects differences across states. **In Washington, rural households will pay 4.8% less and urban households will pay 1.0% more state tax** under a RUC system compared with the current gas tax.

⁸ WSTC, Road Usage Charge Assessment: Financial and Equity Implications for Urban and Rural Drivers, 2015. <https://waroadusagecharge.org/wp-content/uploads/2020/03/20150227URBANRURALREPORT.pdf>.

⁹ RUC West, Financial Impacts of Road User Charges on Urban and Rural Households, 2017. https://www.ebp-us.com/sites/default/files/project/uploads/FINAL-REPORT---Financial-Impacts-of-RUC-on-Urban-and-Rural-Households_Corrected.pdf.

Analysis of the Impact of a RUC on Rural, Suburban, and Urban Households using NHTS Data

As part of this current analysis of the financial and equity implications of transitioning from a gas tax to RUC for households by income level, we considered how average annual costs under these two programs would vary by rural, suburban, and urban geography. Using the data from the 2017 NHTS, we compared RUC and gas tax costs for rural, suburban, and urban US respondent households by income group, using their reported annual fuel consumption, vehicle fuel efficiency, and annual vehicle miles traveled.

Figure A-1, Figure A-2, and Figure A-3 show this breakdown for rural, suburban, and urban households, respectively. The key takeaways are:

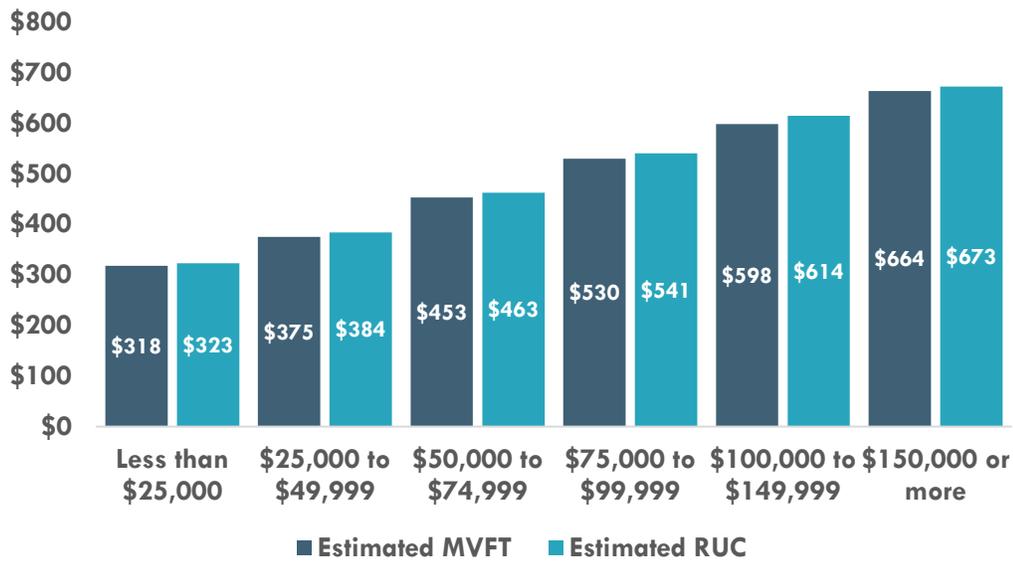
- On average, rural households pay more in gas tax than do urban households, with suburban households falling in the middle. This is true across all income groups.
- Under a RUC, rural households of all income levels would pay a little less (between \$21 and \$29 less, on average) on an annual basis than they do under the gas tax. The average rural household would pay \$24 less annually.
- Under a RUC, suburban households of all income levels would pay slightly less (between \$5 and \$16 less, on average) on an annual basis than they do under the gas tax. The average suburban household would pay \$10 less annually.
- Under a RUC, urban households would pay a little more (between \$13 and \$43 more, on average) on an annual basis than they do under the gas tax. The average urban household would pay \$27 more annually.
- Urban and suburban households would still pay more, on an annual basis, than urban households under a RUC, but the difference would be somewhat narrowed.

Figure A-1. Estimated Average Gas Tax vs. RUC Paid by Income Bracket, US Rural Households



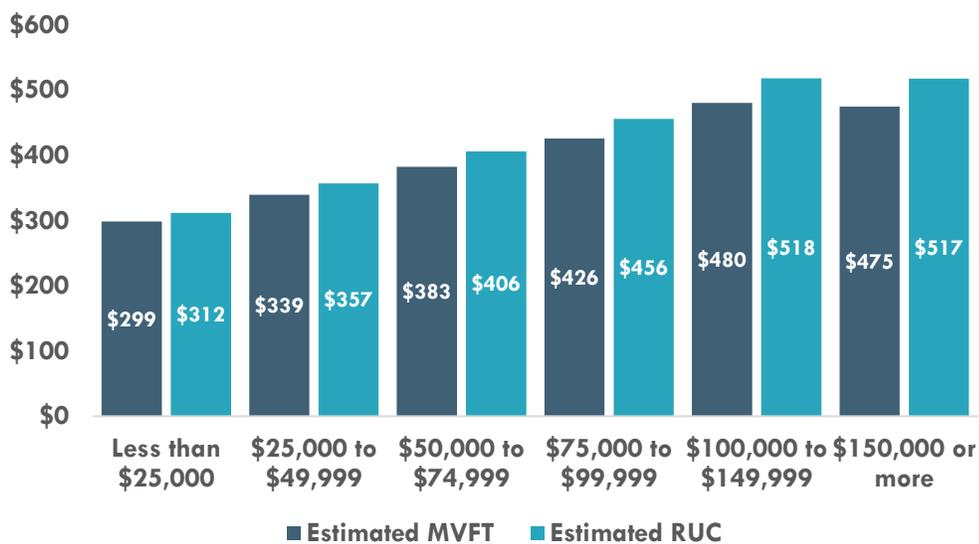
Sources: National Household Travel Survey, 2017; BERK, 2021.

Figure A-2. Estimated Average Gas Tax vs. RUC Paid by Income Bracket, US Suburban Households



Sources: National Household Travel Survey, 2017; BERK, 2021.

Figure A-3. Estimated Average Gas Tax vs. RUC Paid by Income Bracket, US Urban Households



Sources: National Household Travel Survey, 2017; BERK, 2021.

Appendix B: Statistical Analysis of Household Gas Tax and RUC Costs

In this current analysis of the financial and equity implications of a potential transition to a RUC, we estimate household costs under the gas tax and RUC (see Figure 3-18 and Figure 3-19 in Part One) using data from the 2017 NHTS. We conducted a statistical analysis **to understand how these estimates, which are based on households in the NHTS sample of the US population, relate to the actual costs for the full US and Washington state populations.**

Data

The NHTS sample data includes the following data points for households in its dataset:

- Combined vehicle miles traveled (VMT) by all vehicles in the household.
- Total motor vehicle fuel consumption by the household.
- Calculated household vehicle fuel efficiency (calculated by dividing total household fuel consumption by household VMT).
- Household income (a categorical variable).

We used these datapoints to calculate the costs that each household in the sample would pay under the current Washington State gas tax and under RUC. These datapoints were calculated by multiplying the household's annual fuel consumption in gallons by the current gas tax rate of 49.4 cents per gallon (for total state gas tax costs) and by multiplying the household's annual VMT by the proposed RUC rate of 2.4 cents per mile (for total state RUC costs).

We then grouped households into six income groups and calculated the average annual costs under gas tax and under RUC for each group. As Figure 3-18 in Part One shows, in the national sample, for the income groupings under \$100,000, households would pay less, on average, under RUC than under the gas tax. Households earning \$100,000 or more would pay an almost identical amount, on average, under the gas tax and RUC.

However, the results for the Washington state sample do not show a clear pattern – while all of the estimated average gas tax and RUC costs are similar within income groupings (the largest difference is \$20/year), the pattern of which tax/charge is higher is not consistent across income groupings. Given this inconsistency and the small size of the Washington state sample in the NHTS (620 households), we conducted a statistical analysis to understand whether these differences were statistically significant or rather reflect random variation within the samples that does not reflect actual underlying differences in the population.

Statistical Analysis

We conduct paired samples t-tests for each income grouping to understand if the differences observed in average gas tax and RUC costs in the national and Washington state samples reflect actual differences in these calculated gas tax and RUC costs for the national and state populations.

The t-test is a statistical method that considers the size of two samples and the variance within them, as compared to the expected variance in the overall population, to evaluate whether the observed differences between the two samples are likely to reflect an actual difference between the populations underlying the samples. A paired samples t-test is a type of t-test used when the two samples represent two different measurements taken from the same set of units – in this case, the calculated gas tax cost (measurement 1) and the calculated RUC cost (measurement 2) for the same set of households.

The paired samples t-tests allow us to **evaluate how likely it is that the small differences observed in average household costs under the gas tax versus RUC were due to random chance, or due to actual differences in the population**, where “population” means all households of a specific income level in either Washington state or the US.

In this case, the “actual differences” in the population are theoretical, as no Washington state households or US households currently pay RUC. However, the calculated RUC costs used in this analysis are based on an actual metric - household annual VMT. The same holds true for the calculated gas tax costs – the gas tax costs for US households outside of Washington state are not “actual,” because they are based on the Washington State gas tax rate of 49.4 cents per gallon. However, the calculated gas tax costs for US households *are* based on an actual metric – household annual fuel consumption.

Thus, the results of the paired samples t-test allow us to analyze:

- The likelihood that there is a difference between the amount that **US households** (within six different income groupings) would pay per year in gas tax (on average) if they paid the Washington State gas tax rate and what they would pay per year in RUC (on average). *Note that this assumes that each household drives the same number of miles in the same car (or a car of equivalent fuel efficiency) in both the gas tax and RUC scenarios.*
- The likelihood that there is a difference between the amount that **Washington state households** (within six different income groupings) currently pay per year in gas tax (on average) and what they would pay per year in RUC (on average). *Note that this assumes that each household drives the same number of miles in the same car (or a car of equivalent fuel efficiency) in both the gas tax and RUC scenarios.*

Paired Samples T-Tests for US Households

Figure 3-1 in Part Two shows the outputs of the paired samples t-tests for each of the six income groupings for US households. Because we do not have a hypothesis about whether the amount paid under gas tax and RUC will be higher (the direction of the difference), we use two-tailed tests. These tests use an alpha of 0.05.

The null hypotheses for the six tests are as follows:

1. There is no difference between the amount that US households with incomes less than \$25,000 would pay under gas tax and the amount they would pay under RUC.
2. There is no difference between the amount that US households with incomes of \$25,000-\$49,999 would pay under gas tax and the amount they would pay under RUC.
3. There is no difference between the amount that US households with incomes of \$50,000-\$74,999 would pay under gas tax and the amount they would pay under RUC.
4. There is no difference between the amount that US households with incomes of \$75,000-\$99,999 would pay under gas tax and the amount they would pay under RUC.
5. There is no difference between the amount that US households with incomes of \$100,000-\$149,999 would pay under gas tax and the amount they would pay under RUC.
6. There is no difference between the amount that US households with incomes greater than \$150,000 would pay under gas tax and the amount they would pay under RUC.

As shown in Figure 3-1 in Part Two, none of the p-values (highlighted in pink) for any of the six tests are below the threshold of 0.05. This means that, for each test, there is a greater than 5% chance that we would see the differences between the sample means (average gas tax and average RUC costs) that we see if there were truly no difference between the two among these income groupings in the general US population. This probability is too high for us to accept the null hypotheses, so we reject the null hypotheses and **conclude that we do not observe a statistically significant difference in costs paid under the gas tax versus RUC for any income group.**

Figure B-1. Results from Paired Samples T-Test Comparing Gas Tax and RUC Costs for US Households, by Income Grouping

T-Test: Paired Two-Sample Assuming Equal Variances

Less than \$25,000			\$75,000 to \$99,999		
	MVFT	RUC		MVFT	RUC
Mean	337.8391	330.5332	Mean	601.1436	596.6046
Variance	174429.6	145413.1	Variance	278896.5	221579.2
Observations	19665	19665	Observations	16511	16511
Pooled Variance	159921.4		Pooled Variance	250237.9	
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	39328		df	33020	
t Stat	1.811561		t Stat	0.82443	
P(T<=t) two-tail	0.070062		P(T<=t) two-tail	0.409701	
t Critical two-tail	1.960024		t Critical two-tail	1.960036	

\$25,000 to \$49,999			\$100,000 to \$149,999		
	MVFT	RUC		MVFT	RUC
Mean	429.6844	423.3923	Mean	661.6221	663.3459
Variance	216916.4	173818.8	Variance	288942.7	244550.3
Observations	26867	26867	Observations	19622	19622
Pooled Variance	195367.6		Pooled Variance	266746.5	
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	53732		df	39242	
t Stat	1.649928		t Stat	-0.33059	
P(T<=t) two-tail	0.098964		P(T<=t) two-tail	0.740956	
t Critical two-tail	1.960008		t Critical two-tail	1.960024	

\$50,000 to \$74,999			\$150,000 or more		
	MVFT	RUC		MVFT	RUC
Mean	520.4885	514.8233	Mean	699.9715	700.6949
Variance	245661.6	193965.5	Variance	310830.3	233127.4
Observations	22044	22044	Observations	14274	14274
Pooled Variance	219813.6		Pooled Variance	271978.9	
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	44086		df	28546	
t Stat	1.268586		t Stat	-0.11718	
P(T<=t) two-tail	0.204596		P(T<=t) two-tail	0.90672	
t Critical two-tail	1.960018		t Critical two-tail	1.960047	

Note: Households without vehicles and households where data was missing for any of the relevant variables (fuel consumption, VMT, income) were removed from this analysis. Due to the removal of these households from this analysis, sample means and sample sizes may differ slightly from those shown in Figure 3-18 and Figure 3-19 in Part One.

Sources: Federal Highway Administration National Household Travel Survey, 2017; BERK, 2021.

Paired Samples T-Tests for Washington State Households

Figure 3-2 in Part Two shows the outputs of the paired samples t-tests for each of the six income groupings for Washington state households. Because we do not have a hypothesis about whether the amount paid under gas tax and RUC will be higher (the direction of the difference), we use two-tailed tests. These tests use an alpha of 0.05.

The null hypotheses for the six tests are as follows:

1. There is no difference between the amount that Washington state households with incomes less than \$25,000 would pay under gas tax and the amount they would pay under RUC.
2. There is no difference between the amount that Washington state households with incomes of \$25,000-\$49,999 would pay under gas tax and the amount they would pay under RUC.
3. There is no difference between the amount that Washington state households with incomes of \$50,000-\$74,999 would pay under gas tax and the amount they would pay under RUC.
4. There is no difference between the amount that Washington state households with incomes of \$75,000-\$99,999 would pay under gas tax and the amount they would pay under RUC.
5. There is no difference between the amount that Washington state households with incomes of \$100,000-\$149,999 would pay under gas tax and the amount they would pay under RUC.
6. There is no difference between the amount that Washington state households with incomes greater than \$150,000 would pay under gas tax and the amount they would pay under RUC.

As shown in Figure 3-2 in Part Two, none of the p-values (highlighted in pink) for any of the six tests are below the threshold of 0.05. This means that, for each test, there is a greater than 5% chance that we would see the differences between the sample means (average gas tax and average RUC costs) that we see if there were truly no difference between the two among these income groupings in the general Washington state population. This probability is too high for us to accept the null hypotheses, so we reject the null hypotheses and conclude that **we do not observe a statistically significant difference in costs paid under the gas tax versus RUC for any income group.**

Figure B-2. Results from Paired Samples T-Test Comparing Gas Tax and RUC Costs for Washington State Households, by Income Grouping

T-Test: Paired Two-Sample Assuming Equal Variances

Less than \$25,000			\$75,000 to \$99,999		
	MVFT	RUC		MVFT	RUC
Mean	323.8469	314.7822	Mean	494.5397	490.0406
Variance	86073.84	70210.04	Variance	153353	132674.2
Observations	74	74	Observations	80	80
Pooled Variance	78141.94		Pooled Variance	143013.6	
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	146		df	158	
t Stat	0.197246		t Stat	0.075243	
P(T<=t) two-tail	0.843909		P(T<=t) two-tail	0.940116	
t Critical two-tail	1.976346		t Critical two-tail	1.975092	

\$25,000 to \$49,999			\$100,000 to \$149,999		
	MVFT	RUC		MVFT	RUC
Mean	393.1894	409.9088	Mean	503.5153	523.8578
Variance	179051.2	291666.6	Variance	117017.6	108985.3
Observations	110	110	Observations	119	119
Pooled Variance	235358.9		Pooled Variance	113001.4	
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	218		df	236	
t Stat	-0.25559		t Stat	-0.46679	
P(T<=t) two-tail	0.798512		P(T<=t) two-tail	0.641081	
t Critical two-tail	1.970906		t Critical two-tail	1.970067	

\$50,000 to \$74,999			\$150,000 or more		
	MVFT	RUC		MVFT	RUC
Mean	461.1609	468.5456	Mean	512.7429	504.7609
Variance	142040.8	129677.4	Variance	143440.3	97584.83
Observations	126	126	Observations	88	88
Pooled Variance	135859.1		Pooled Variance	120512.5	
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	250		df	174	
t Stat	-0.15902		t Stat	0.152519	
P(T<=t) two-tail	0.873779		P(T<=t) two-tail	0.878955	
t Critical two-tail	1.969498		t Critical two-tail	1.973691	

Note: Households without vehicles and households where data was missing for any of the relevant variables (fuel consumption, VMT, income) were removed from this analysis. Due to the removal of these households from this analysis, sample means and sample sizes may differ slightly from those shown in Figure 3-18 and Figure 3-19 in Part One.

Sources: Federal Highway Administration National Household Travel Survey, 2017; BERK, 2021.

Regression Analysis of Estimated RUC Costs

The finding of no difference between average gas tax and RUC costs raises a question about the impact that vehicle fuel efficiency has on gas tax costs. Because RUC costs are purely driven by VMT and gas tax costs are driven by a combination of VMT and vehicle fuel efficiency, the finding of no difference in costs between the two programs seemingly implies that **vehicle fuel efficiency has minimal impact on the variation in total annual gas tax costs among Washington state households.**

To test this question, we run a regression analysis with household gas tax costs as the dependent variable and VMT and vehicle fuel efficiency as the independent variables. The advantage of using a regression analysis in this case is that it allows us to examine how much of the variation in total annual household gas tax costs is explained by VMT versus fuel efficiency.

The results of the regression analysis show that more than 90% of the variation in total annual gas tax costs for US households is explained by VMT and fuel efficiency together. Separate regressions analyzing the isolated impact of VMT and fuel efficiency show that **VMT accounts for 88.8% of the variation in total annual household gas tax costs, while fuel efficiency accounts for just 2.9% of the variation** (see Figure 3-4 and Figure 4-1 in Part Two).

The results of the same regressions for Washington state households have similar results – 88.7% of the variation in total annual gas tax costs for Washington state households is explained by VMT and fuel efficiency together (Figure 4-1 in Part Two), with VMT explaining 86.2% of the variation and fuel efficiency explaining just 2.8% (results not shown).

Another way to consider this finding is to look at the coefficients for the VMT and fuel efficiency variables in the regression analysis (Figure 3-3 in Part Two). For each additional mile a US household drives, their annual gas tax costs increase by 2.5 cents – this is nearly identical to the proposed RUC rate of 2.4 cents, which makes sense as the proposed RUC rate has been calculated to be equivalent to the current per-mile gas tax costs for the average Washington state household. In fact, in the regression analysis for Washington state households, each additional mile driven increases a household's annual gas tax burden by 2.4 cents (Figure 4-1 in Part Two).

On the other hand, each additional mile-per-gallon (MPG) of fuel efficiency reduces a US household's annual gas tax burden by \$12.26 (for Washington state households, it is \$10.16). At first glance, this may seem large in comparison to the impact of miles driven, but the reverse is actually true when the full context is considered. The number of miles that US and Washington state households drive per year varies widely and one additional mile is a very small increment.

For example, US households at the 25th percentile of VMT drive 9,519 miles per year, but those at the 75th percentile drive 28,647 miles per year, a difference of more than 19,000 miles. The difference in total gas tax burden between these two households (if they have the same vehicle fuel efficiency) is \$416.55 over the course of a year.

In contrast, the range of vehicle fuel efficiencies among US households is much narrower. A US household at the 25th percentile of fuel efficiency has an efficiency of 19.0 MPG, while a household at the 75th percentile has an efficiency of 25.0 MPG. The difference in total gas tax burden between these two households (if they drive the same number of miles) is \$135.64 over the course of a year.

It is worth noting that these findings are based on 2017 data, when the percentage of hybrid and electric vehicles in the US and Washington state fleets are lower than they are in 2021, and likely significantly lower than they will be in the years to come. As the proportion of hybrid and electric

vehicles increases, the range of vehicle fuel efficiencies will increase and the impact of fuel efficiency on total annual gas tax burden is likely to rise as well.

Figure B-3. Results from Regression Analysis of the Impact of VMT and Fuel Efficiency on Household Gas Tax Costs for US Households

SUMMARY OUTPUT

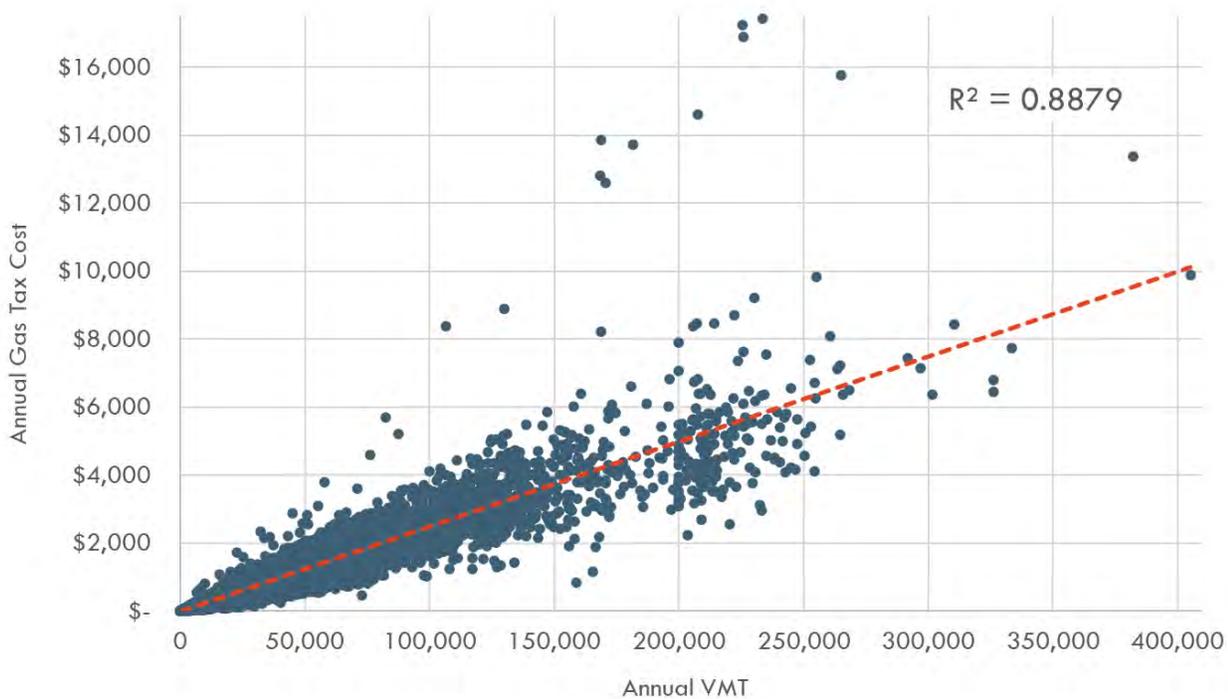
Regression Statistics	
Multiple R	0.953149784
R Square	0.908494511
Adjusted R Square	0.908493023
Standard Error	154.4201625
Observations	123002

ANOVA					
	df	SS	MS	F	Significance F
Regression	2	29119556249	14559778125	610585.8652	0
Residual	122999	2932983306	23845.5866		
Total	123001	32052539555			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	262.761128	1.809513175	145.2109504	0	259.2145124	266.3077435	259.2145124	266.3077435
Total VMT	0.02488538	2.28874E-05	1087.296577	0	0.024840521	0.024930239	0.024840521	0.024930239
Total MPG	-12.25867056	0.073657735	-166.427471	0	-12.40303848	-12.11430263	-12.40303848	-12.11430263

Sources: Federal Highway Administration National Household Travel Survey, 2017; BERK, 2021.

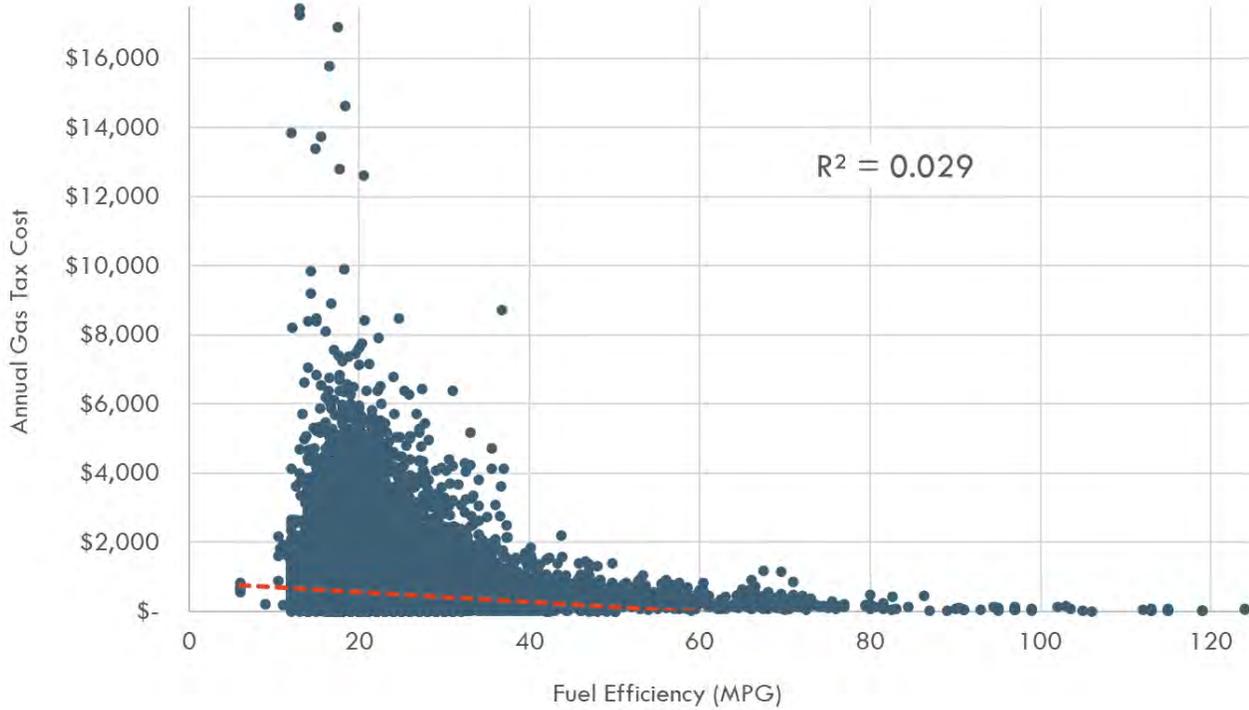
Figure B-4. Relationship Between Annual VMT and Gas Tax Costs, US Households



Note: R² is a statistical measure that indicates the proportion (or percentage) of variation in a dependent variable that is determined by the variation in one or more independent variables.

Sources: Federal Highway Administration National Household Travel Survey, 2017; BERK, 2021.

Figure B-5. Relationship Between Vehicle Fuel Efficiency and Gas Tax Costs, US Households



Note: R² is a statistical measure that indicates the proportion (or percentage) of variation in a dependent variable that is determined by the variation in one or more independent variables.

Sources: Federal Highway Administration National Household Travel Survey, 2017; BERK, 2021.

Figure B-6. Results from Regression Analysis of the Impact of VMT and Fuel Efficiency on Household Gas Tax Costs for Washington State Households

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.942186784
R Square	0.887715936
Adjusted R Square	0.887351969
Standard Error	144.2370968
Observations	620

ANOVA

	df	SS	MS	F	Significance F
Regression	2	101483398.8	50741699.41	2438.995862	1.0547E-293
Residual	617	12836277.84	20804.3401		
Total	619	114319676.7			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	239.3346767	21.969702	10.89385175	2.13486E-25	196.1902187	282.4791346	196.1902187	282.4791346
Total VMT	0.023764592	0.000346045	68.67482866	3.62774E-291	0.023085023	0.024444161	0.023085023	0.024444161
Total MPG	-10.16212218	0.860365779	-11.81139747	3.62645E-29	-11.85172248	-8.472521876	-11.85172248	-8.472521876

Sources: Federal Highway Administration National Household Travel Survey, 2017; BERK, 2021.

Appendix C: Tax Incidence of State Gas Tax

This appendix provides justification for our assumption that consumers are currently bearing the full cost of the 49.4 cents per gallon gas tax (rather than sharing the true cost with fuel suppliers). If Washington transitioned from a gas tax to a RUC, consumers would continue to bear the full cost of the RUC cost. This means there would be no change in who is paying the true cost and we can compare the two taxing mechanisms using the full rate of 49.4 cents per gallon.

One of the primary differences between the proposed road usage charge (RUC) and the existing Washington State gas tax is that the RUC charges people for use of a resource (roads), while the gas tax charges people for a good they buy (gasoline).

- By design, there are only **two parties** involved in the process of paying the RUC – the vehicle owner (who pays the RUC) and the State (which receives the RUC).
- For the gas tax, there are **three parties** involved – the gas buyer, the gas seller, and the State.
- Foundational economic theory and extensive research by economists has shown that when a tax is imposed on a good that has a buyer and a seller, the tax burden is split between the buyer and seller (*even if the consumer appears to pay the price upfront*).¹⁰ The nature of the split depends on the good.

To compare the impacts of a RUC and gas tax on taxpayers, we need to first understand what proportion of the current gas tax burden is borne by consumers of gasoline, as opposed to sellers. **If consumers bear the full costs under both taxing mechanisms, then we can compare the two directly**, without adjusting the effective gas tax rate to account for any absorption of costs by gas sellers.

Who pays taxes?

An important consideration when a government decides to impose a new tax on a good is, “**who will pay the tax?**” The distribution of the tax burden between consumers (or buyers) and producers (or sellers) is called the **tax incidence**.

An example: sales and excise taxes

For most sales and excise¹¹ taxes, the retailer collects the tax from customers and remits the revenue to the government that has imposed the tax.

For example, the State of Washington levies a 6.5% sales and use tax on most goods sold in the state. Retailers set prices for the goods they sell, calculate 6.5% of the sale price, and then charge that amount to consumers in sales tax at time of purchase. The retailer then remits the tax revenue collected from all its customers to the State monthly. In this case, **it seems like the consumer is paying the full amount of the sales tax**, because 6.5% is added to the sale price and the consumer pays this amount.

¹⁰ Among others, see François Quesnay (1762), Adam Smith (1776), Edwin R.A. Seligman (1892), Gordon Hayes (1921), and Peter Mieszkowski (1969).

¹¹ Excise taxes are sales taxes on a specific good. The gas tax is an excise tax, along with alcohol taxes, cigarette taxes, etc.

However, in reality, retailers actually adjust the underlying price (the pre-tax price) of goods to account for the fact that consumers will pay a higher total price when the tax is applied. If retailers didn't adjust the underlying price, then they would sell fewer items because the price increase caused by the tax would lead some consumers to buy fewer goods. To avoid losing this revenue, retailers lower the price of their goods (thus absorbing some of the tax).

How much do they lower the price by?

The amount that the retailer will lower the price by depends on the type of good.

- For example, toilet paper and soap are household staples, so most people will continue buying the same amount they did before, even if the price is now 6.5% higher due to the tax.
 - If a retailer keeps the price of toilet paper or soap the same after a new tax is imposed, this likely will only have a very small effect on the number of toilet paper rolls or bars of soap it sells. Retailers can still sell the same number of toilet paper rolls and bars of soap even if they only reduce the pre-tax price by a very small amount.
 - For these types of goods, consumers will bear most of the burden of the tax.
- On the other hand, jewelry or leather handbags are not household staples and consumers that have limited ability to pay or who are frugal can more easily adjust their behavior to avoid paying the extra 6.5% due to a tax.
 - If a new tax is imposed that applies to jewelry or leather handbags, even small changes in price will cause some consumers to purchase these items less frequently or purchase lower-end versions of them.
 - Retailers have an incentive to lower the pre-tax price of the jewelry and handbags because selling them at a lower price is preferable to not selling them at all. So, retailers will reduce the pre-tax price by some percentage between 0% and 6.5%, *thus absorbing part of the cost of the tax*, even though the customer still pays 6.5% in tax beyond the new "pre-tax" price.
 - For these types of goods, retailers will bear most of the burden of the tax.

Price Elasticity

The factor that determines what proportion of the tax incidence falls on producers versus consumers is the **relative price elasticity of supply and demand**. **Price elasticity** refers to how sensitive consumers and producers are to changes in the price of a good.

- If consumer demand is highly price elastic (like jewelry or leather handbags), consumers as a group will respond to even small increases in the price of a good by reducing the quantity of that good that they collectively consume.
- If consumer demand is highly inelastic (like toilet paper and soap), then it requires a very large price change for consumers collectively to change the quantity of the good that they consume. Also inelastic are goods that have few or no substitutes (e.g., a name brand prescription drug without a generic alternative) and goods where consumers need lots of time to change their consumption patterns (e.g., automobiles, which most people only buy every few years at most).

The same principle applies to price elasticity of supply.

- If supply is highly elastic, producers will respond to small price drops by reducing the quantity of that good that they supply, while if it is highly inelastic, it will require a large price change for them to change the quantity they supply.

- The type of good and the way it is produced affects how easily producers can adjust the quantity that they supply.

Tax Incidence of the State Gas Tax

Economists have extensively studied the tax incidence of gasoline taxes.

- Chouinard and Perloff (2003) found that the incidence of state gasoline taxes **fall almost entirely on consumers**. In contrast, the incidence of the federal gasoline tax is split relatively evenly between consumers and producers. This is because producers can relatively easily adjust the quantity that they supply to states in response to their specific gas taxes. Consumers, on the other hand, have a hard time reducing their gasoline consumption in the short-term because decisions like moving closer to one's workplace, buying a more fuel-efficient vehicle, etc., cannot be made quickly. Thus, the price elasticity of supply is relatively more elastic than the price elasticity of demand as far as state gas taxes are concerned. It is more difficult for suppliers to adjust their quantity supplied on a national scale, so the incidence of the federal gas tax is more evenly split between producers and consumers.
- Marion and Muehlegger (2011) also find that state gasoline taxes are **fully and instantly passed on to consumers**, though they note this incidence shifts somewhat at times of supply chain constraint, such as during peak driving seasons and after natural disasters.

Washington State's Gas Tax

Given this study's exclusive focus on the State gas tax and its orientation towards order-of-magnitude estimates of consumer impact, **it appears justified to assume that the incidence of the Washington State gas tax falls entirely on consumers**. If Washington transitioned from a gas tax to a RUC, consumers would bear the full cost of the RUC cost.

This means there would be no change in who is paying the true cost under such a transition and we can compare the two taxing mechanisms as we have in this study.

Appendix D: Letter of Invitation

April 1, 2021

Greetings:

We hope this email finds you well.

Below is important information about the money you pay to drive on Washington State roads. With all that's going on in the world right now, you may not have given this any thought. But the way we fund transportation-that is maintaining our roads and building new ones-is changing and we are asking you to help us with new ideas about paying for this change in a fair and equitable way.

The Washington State Transportation Commission (WSTC), which is charged with setting equitable transportation funding policies, wants your feedback as it explores new systems for funding roads. The Commission wants your thoughts on how best to replace the current gas tax with a system that will charge drivers for miles driven.

We are especially interested in the impact a system like this will have on under-represented communities and what possible mitigation measures may be necessary. We need organizations/agencies such as yours to get involved and help us shape the policy and program details for a future statewide road usage charge or RUC program.

As gas tax revenues begin to decline and adoption of electric cars increases, we must find new ways to fund our state's transportation system into the future. Establishing a road usage charge program will ensure we have long-term, sustainable funding, but the impacts of doing so must be understood.

To improve our understanding, we are reaching out to you. This is a chance for your organization and its members, clients, and constituents to be engaged early in a major transportation issue that will truly shape our collective future. Join us and share your views and ideas.

If you or your group are interested in participating in this effort, please contact us at:
<waroadusagecharge.org<<http://waroadusagecharge.org>>> or 206-669-2084 to get more information.

Thank you.

Sincerely,

Reema Griffith, Executive Director

Washington State Transportation Commission

Appendix E: Focus Group Questions

Thank you for joining us. We appreciate your taking time out of your schedule. My name is _____ and I will be moderating this session. We are meeting to get your comments and questions on a new way to fund road building and maintenance. We will ask you 13 questions and want your feedback after thinking about each for a minute or two. This is not a test and there are no wrong answers. We are recording this session. We will keep your name and personal information confidential.

Ice Breaker: Favorite place to drive in or out of Washington state;

Let's go around the room (screen, if virtual) and please give:

- o Your First Name
 - o Occupation
 - o Number of People in Your Household
 - o Make and Model
 - o Year of Your Vehicle
 - o Where you usually drive (ex. work, errands)
 - o How many miles you drive per week
 - o Type of driving you do – highway, city, rural, etc.
 - o (Check One)Age Range: 18-29; 30-49; 50-65; 65+
 - o Ethnicity_____
 - o (Check One) Economic Range: Economic Range: 0—\$50,000__ \$51,000—\$100,000__ \$100,001 + __
 - o #####
1. How familiar are you with how road repair, maintenance, and new construction are paid for in our state?
 2. Most of our road repair, maintenance, and new construction is paid through taxes on gasoline. How much do you think you personally pay in gas tax every year?
 3. Have you ever heard of charging people directly for how much they use the road instead of taxing gasoline?—That's a road usage charge.
 4. Our topic is a Road Usage Charge. Had you ever heard about this topic before you were contacted to participate in this group? If so, what did you hear and where?
 5. In one sentence or a few words, what are your first thoughts when you hear the phrase Road Usage Charge?

Discussion / Comments

A Road Usage Charge is a fee that you pay based on the **number of miles you drive** on Washington roads. The road usage charge would go toward repairing and building roads and bridges, which are currently funded by a tax on each gallon of gas purchased. Why a road use charge now? There are many vehicles that do not run on gas, yet use the roads and bridges currently funded by the gas tax. Because those vehicles are becoming more plentiful and some manufacturers have actually said they

are not building any more cars that run on gasoline, the state must find a way to make up for gas tax money it will not have in the future. In addition, there is a fairness component here.

6. What do you think about a road usage charge in Washington State?
7. What are the advantages to this idea?
8. Disadvantages?
9. Would this be a fair charge to all populations or would some be disadvantaged?
10. If you answered that some would be disadvantaged. Who and how?
11. How can the state address those communities that may be disadvantaged by a road use charge?

Discussion / Comments

Let's now move to another unanswered question regarding a potential road use charge -- how do you think it ought to be collected? The gas tax is already included in the price of gas you pay at the pump, which is easy. Please give us your thoughts on five different ways to report the number of miles you've driven so that the road usage charge can be collected. Also, let us know your preference for how to pay once mileage is reported:

MILEAGE REPORTING OPTIONS: Rank these with 1 being the LEAST preferred and 5 being the PREFERRED

- A. _____ Device attached to the car that counts the number of miles driven automatically, with or without GPS. With GPS, you can exclude the number of miles you drive off road or out of state.
- B. _____ Smartphone app that counts the number of miles driven, with or without GPS
- C. _____ Licensed professional reads the odometer
- D. _____ You take a picture of your odometer and submit it using a mobile phone
- E. _____ Instead of counting miles, you pay a high lump sum to drive an unlimited number of miles annually.

Please tell us what you like and don't like about each option:

Discussion / Comments

PAYMENT OPTIONS: Rank these with 1 being the LEAST preferred and 5 being the PREFERRED. Each of the options below describes how you would pay for the number of miles you drove. At 2.5 cents per mile if you drove 10,000 miles in a year, you would owe \$250. If you drove 20,000 miles you would owe \$500.

- A. _____ Pay the amount you owe with your vehicle registration yearly, using the same process you use to pay for vehicle registration
- B. _____ Pay over the internet or using a phone app yearly, separate from the vehicle registration process
- C. _____ Pay over the internet or using phone app monthly, separate from the vehicle registration process

D. _____ Fill a “driving wallet” with funds that are used to pay for your road usage charge as you drive. Any time your wallet falls below \$20, your bank account or credit/debit card is automatically charged to reload your wallet.

E. _____ Pay in person at a retail location using cash, check, or money order.

Please tell us what you like and don’t like about each option.

Discussion / Comments

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Thank you all for your time and attention to this effort. As a reminder, your comments will not be attributed to you. This is an anonymous process. Your comments will not be attributed.

Please let us know if you are interested in being part of upcoming Forward Drive and Road Usage Charge events. Thank you!!!